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AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XV APRIL 19, 1926 NUMBER 6

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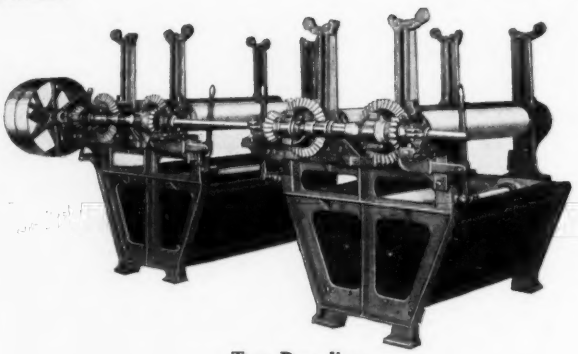

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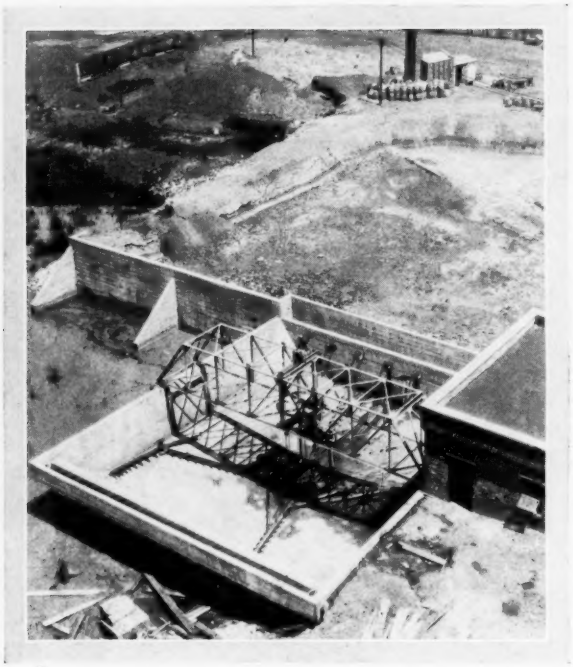

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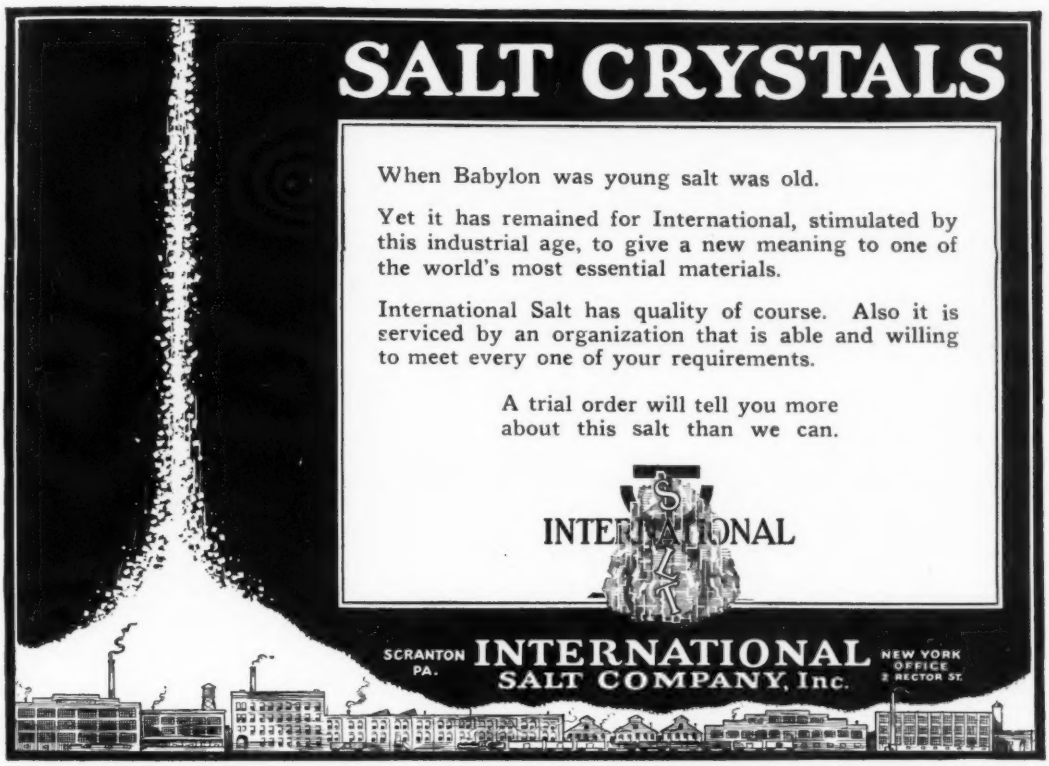
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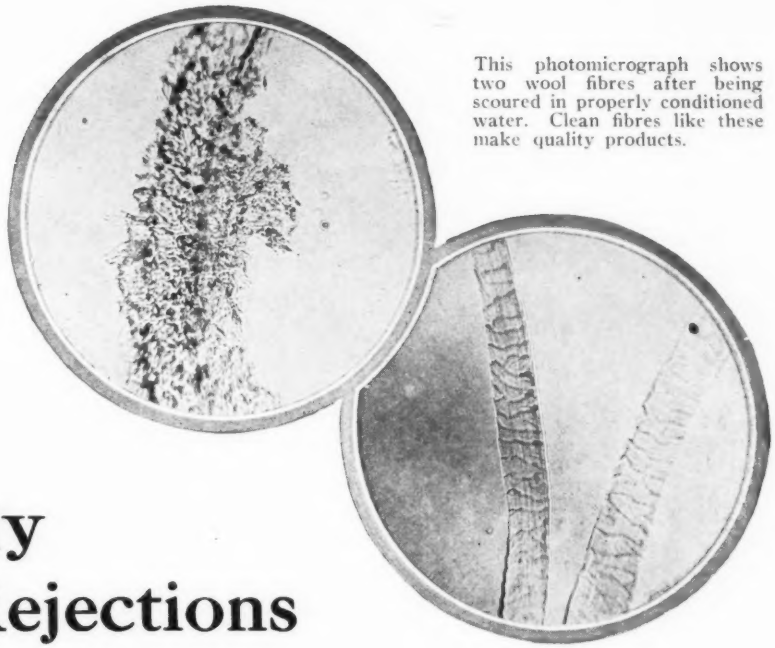
This is a photomicrograph of a wool fibre after being scoured in raw water. Note the particles which cling to it. They are sticky deposits formed by impurities in the water. This condition is likely to cause rejections.



This photomicrograph shows two wool fibres after being scoured in properly conditioned water. Clean fibres like these make quality products.

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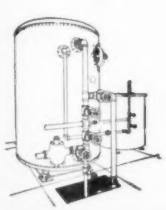

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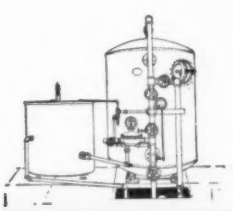

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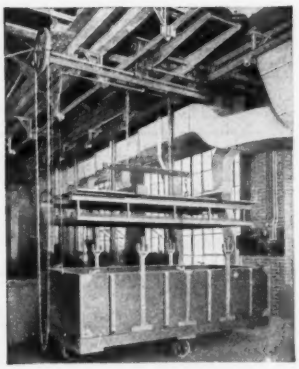

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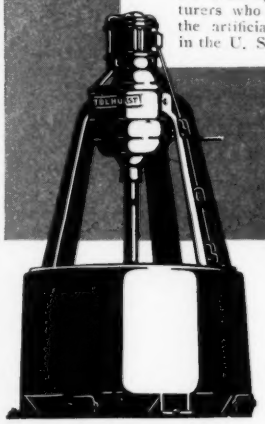

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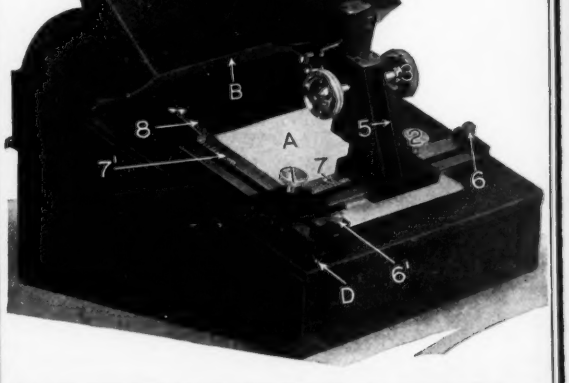

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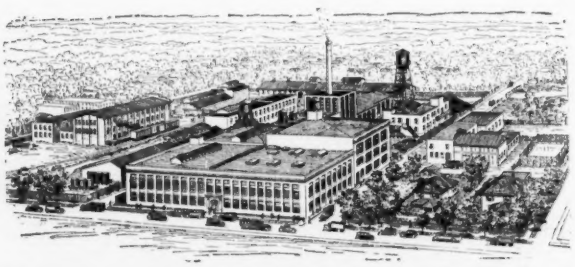

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VOLUME XV NEW YORK, APRIL 19, 1926 NUMBER 6

Wool

THE INTRODUCTION TO A SERIES OF PAPERS UPON THE CONSTITUTION, PROPERTIES, REACTIONS, DYEING, ETC., OF WOOL, WITH ABSTRACTS FROM THE LITERATURE AND PATENTS UPON THESE AND RELATED SUBJECTS

"Soaps and Proteins"—"Physiological Chemistry"—Loeb's Work and Book—General Considerations

By CHAS. E. MULLIN, M.Sc., F.A.I.C.

Consulting Chemist, Camden, N. J.

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FOR some time past there appears to have been considerably more research work in the textile field upon the constitution, properties, reactions and processes of cotton and cellulose, than upon the proteins wool and silk. Very possibly this is at least in part due to the present activity and interest in the various rayons, which of course are cellulosic products. Fortunately the proteins have not been neglected quite so much in other fields of endeavor, for instance, in medical and biological research, but the busy textile chemists and technologists have not been particularly active in applying the results of these researches to their theories and processes.

In the series of papers of which this serves as the preface, the writer will attempt to partially review the literature upon wool and silk, as well as on other related proteins, not only in the textile but in all other fields of research, and to some extent correlate this vast amount of information with our present knowledge of textiles. In order to keep this large volume of data within some bounds, the subject has been studied particularly from the standpoint of wool, the other proteins being considered only on account of their general relation to wool, as proteins in common.

Particular attention has been given to the chemical literature since 1910, including the early months of 1926, and the author is indebted to the various American and foreign abstract journals, where the original sources were unavailable. In order to facilitate reference to the original publications, complete references are given wherever possible, as well as occasional abstracts of matter related only in a general way to the particular subject under discussion. It is hoped that this may serve to some extent as a bibliographic source of references to the literature upon the subject of wool. However, the bibliography is far from complete, as particular attention has been given to the chemical aspects of the subject. As a chemist, the author is glad to admit a prejudice in favor of the chemical theories, such as the chemical theory of dyeing.

"Soaps and Proteins"

It is seldom that a worker in one field takes the trouble and makes the effort to correlate his work with the problems in an entirely different field. "Soaps and Proteins," by Dr. Martin H. Fischer, Eichenberg Professor of Physiology in the University of Cincinnati, and Doctor of Medicine, is one of the few successful efforts of this kind. In this book Dr. Fischer has succeeded in giving to chemists a better understanding of the theory of soap and in fact all detergent problems in general than was ever before possible.

As Dr. Fischer's work also deals with proteins as well as soaps, this work is applicable to another phase of textile work, that is, the fibers wool and silk. As all textile fibers have colloidal properties, and are commonly, but incorrectly, classed as "colloids," much of Dr. Fischer's work is also applicable to many other problems and processes in the textile field. For this reason, as well as the fact that the textile industry is the one most interested in detergent problems, outside of the soap industry, every textile technologist should read this book, especially if interested in wool or silk.

Some of Dr. Fischer's later work has been upon the properties of phenol-water systems. It is a peculiar and interesting fact that the many phases present in such a

system, as described in "On the Electrical Resistance of Phenol-Water Systems and Protoplasm," *Science 47*, No. 1486, 724-7 (1923) and other papers, collectively possess many properties in common with protein systems and even living cells, and may be used to illustrate the various properties of living cells. As wool is composed of cells which were once living, such systems undoubtedly may be used by the physical chemist to study some of the less understood properties of this fiber.

In preparing this series of papers the writer has had some correspondence with Dr. Fischer, and he has been most kind and courteous in supplying copies of his more recent papers upon related subjects, with comments, suggestions, etc., and I therefore wish to express my gratitude, indebtedness and thanks to him for this help.

"Physiological Chemistry"

Dr. Albert P. Mathews, Professor of Biochemistry at the University of Cincinnati, and author of "Physiological Chemistry," as well as Dr. Philip B. Hawk, Professor of Chemistry and Toxicology at Jefferson Medical College, assistant editor of "Chemical Abstracts," and author of "Physiological Chemistry," have also been very kind in allowing the writer to use material upon the proteins and their constitution from their books. These authors have treated the proteins and amino acids in such a comprehensive and concise manner that the material is in a form particularly applicable to the textile proteins, wool and silk.

Loeb's Work and Book

Last but certainly not least, I wish to call attention to the monumental book of Dr. Jacques Loeb (deceased), Member of the Rockefeller Institute for Medical Research, on "Proteins and the Theory of Colloidal Behavior," published by the McGraw-Hill Company, who have kindly granted the writer permission to quote from this book. Dr. Loeb's work and book are truly the last necessary proof of the chemical reactions of the proteins and their combination in strictly stoichiometrical proportions.

In all of Loeb's work the hydrogen ion theory has received full consideration, and in fact frequently forms the principal basis of the work. The hydrogen ion theory has had a much wider application in biological work than in the textile fields, and even yet the importance of this factor in connection with practical textile work appears to be realized by only the more progressive technologists. However, the application of this theory to the reactions and theories regarding proteins, including wool and silk, has done more than any other one thing to clear up the haze which formerly surrounded the various protein reactions. No present-day theory regarding protein reactions, including dyeing, is complete unless the hydrogen ion factor has been given full consideration.

Without doubt all of Loeb's work and theories are more or less directly applicable to both textile theory and practice. The hydrogen ion theory is absolutely indispensable in all textile work involving chemicals. The writer will merely endeavor to point out some few of their many applications in connection with wool and silk.

General Considerations

In the study of wool and silk, both of which are complex colloidal proteins in structure and composition, too much attention cannot be paid to the study of protein and colloidal materials in other fields. Perhaps more work on the study of proteins has been done in the field of biological chemistry than in any other. The proteins all have colloidal properties under certain conditions, and therefore we cannot neglect the field of colloidal phenomenon in any study of wool and silk, or other proteins.

Truly a study of the work in biological fields on the proteins is a great help in understanding the various actions of the different processes and chemicals used in the many manufacturing operations upon wool and silk. The effects of acid, alkalies, metallic salts, temperature, etc., upon the solubility and hydrolysis of the proteins has been carried much further in physiological fields than in the textile field. The bearing of this work even on the subject of regain is very considerable, while that upon scouring, dyeing, mordanting and other processes is tremendous.

While all textile men and chemists agree that both wool and silk are proteins and have colloidal properties, and that a large portion of all living matter belongs to the protein class and therefore also has colloidal properties, it is only within the last few years that any effort has been made to correlate the work of the biochemists with the work of the textile chemist and plant. Physiological chemistry, as it includes the study of the materials composing, and chemical reactions within our bodies, is the most important field of chemistry known to man. Therefore it is not surprising that far more research has been done in this than in the textile field.

The remarkable thing about it is that the textile men have not been quicker to adapt the chemical and other theories so largely accepted in biological fields to the textile theories and processes, such as mordanting, dyeing, scouring, conditioning, drying, etc. While many textile workers have from time to time advanced theories on dyeing, etc., more along the present line of thought of the biochemists, these theories have not been generally accepted and it is only since Loeb's book on "Proteins" appeared (1922) that the "chemical" theories regarding the proteins have again come into much prominence.

It would be only too easy to write a series of books upon the possible relation of the recent work to textile theories and practice. Perhaps another series could be written regarding its relation to the leather and tanning industries, as well as the other innumerable processes and industries involving proteins and colloidal materials. However, as the present papers are merely a series of

journal articles, the discussion will be principally confined to wool, with only occasional mention of silk and the other textile fibers, where the relation is particularly obvious, or as is frequently the case, unavoidable.

For instance, we have to-day many "artificial silks," none of which are in the same chemical classification as true silk, but all of which possess colloidal properties in common with proteins. However, the casein and gelatin silks which have never appeared upon the market commercially, may develop into a very close competitor for the natural product. Casein and gelatin are both proteins also, and as such possess colloidal properties. While we have artificial wools with colloidal properties, we have no artificial product resembling wool in chemical constitution or physical properties.

Due to our limited knowledge of the proteins and the large number of them which are possible, we are as yet unable to synthesize the more complex products, but some progress has been made upon some of the simpler compounds of this class. Eventually, possibly in the far distant future, we may be able to complete this synthesis, and then we may look for the true artificial wool and silk, as well as artificial foods. In fact, it is only within very recent years that we have been able to make even a fairly satisfactory separation of the protein decomposition products, and as yet we have only scratched the surface in this vast field.

(*The second article in this series will appear in an early issue.*)

The Choice of Solvent in Spectrophotometric Dye Analysis

By WALTER C. HOLMES

(*Contribution No. 117, from the Color Laboratory, Bureau of Chemistry, Washington, D. C.*)

WHEN wisely selected technique is employed, spectrophotometric methods of dye analysis compare favorably with the reduction (titanous chloride) method. Of the factors which influence their dependability, none is more important than the selection of the most advantageous solvent.

Spectrophotometric evaluations of dyes are almost invariably carried out in aqueous solvents. It has been shown [1] that a large proportion of dyes undergo tautomeric alteration in aqueous solutions, with modifications in their absorption spectra which are frequently of an extreme order. In many instances these alterations are encountered over the range of concentration within which the measurements are made in analytical practice.

It is obvious that the occurrence of these phenomena will invalidate the results obtained in spectrophotometric analysis when the customary technique is employed. In practical effect the analyst in such cases deals with a mixture of two dyes rather than with a single substance, as he supposed, and Beer's law is inoperative because variation in concentration modifies not only the degree of molecular dispersion of these components but also their relative proportions. A recent investigation by French [2] of the absorption of Methylene Blue affords a good illustration of the serious errors which may arise from this source in a typical instance.

In determining the dye-content of individual dyes such anomalies may be avoided readily by a simple modification in technique. The standard data are obtained with such regulation of concentration as will fix the extinction coefficients at and near the maximum of the dye within the particular range of light intensity in which the analyst's measurements are most accurate. In the evaluation of future samples of the dye the preparation of the solutions is varied in whatever degree is necessary in order that the comparative measurements shall be made at substantially the same intensities. In other words, all critical measurements are made at nearly identical concentrations of *actual* dye, and evaluation is based principally on variations in the preparation of the solutions rather than on wide variations in absorption values. Apart from any consideration of its efficiency in the elimination of anomalous concentration effects, this course is preferable to the customary practice because it insures maximum photometric accuracy.

In the evaluation of dye mixtures, however, it is frequently necessary to rely upon the comparative values of absorption measurements obtained with concentrations of actual dye which vary greatly.[3] The analyst who is concerned solely with dye-content will probably prefer the reduction method to the spectrophotometric method with individual dyes, the more particularly because it necessitates no preliminary determination of standard values. He will probably resort to the spectrophotometric method only when the reduction method is inapplicable. With dye mixtures, however, the utility of the reduction method is somewhat restricted.[4] In that field of application the

[1] Holmes, Ind. & Eng. Chem. (1924), **16**, 35.
[2] Awaiting publication in Ind. & Eng. Chem.
[3] Holmes, Am. Dyestuff Rep. (1926), March 22.
[4] Holmes, Am. Dyestuff Rep. (1925), **14**, 415.

spectrophotometric method will be much more extensively employed.

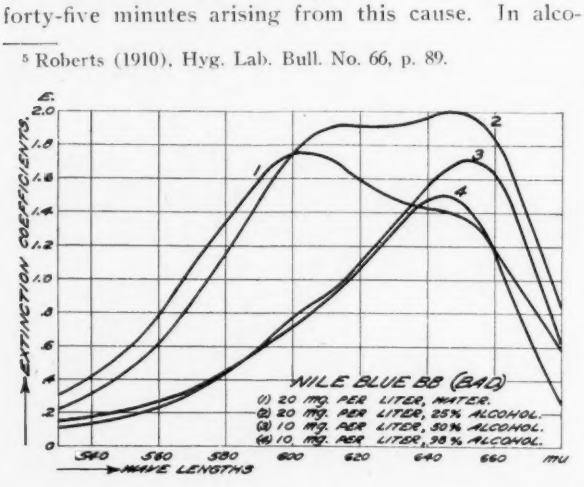
An alternative course which is equally effective with individual dyes is a necessity in order to obtain reliable results with many dye mixtures. This consists in the employment of alcoholic-aqueous mixtures. The absorptions of dyes in alcohol correspond within moderate limits to their absorptions in water at great dilutions, and the phenomenon of tautometric alteration and radical modification of spectrum with change in concentration is seldom encountered in alcoholic solutions.

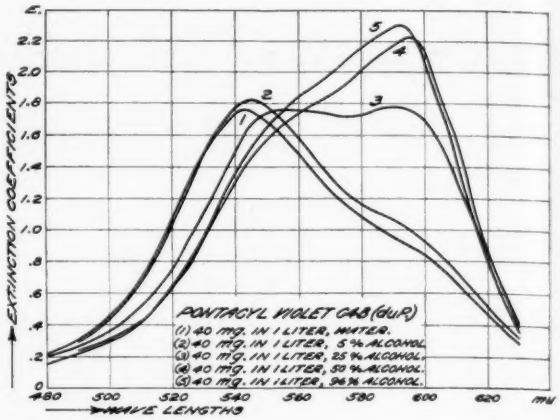
It is neither convenient nor necessary to employ absolute alcohol. Only about 50 per cent of alcohol is required to practically free the solute from anomalous concentration effects. Further increase in alcoholic content is attended only by minor alterations in absorption spectra, which may be attributed to changes in state of molecular associations and to the normal minor band displacement incident to change of solvent.

The use of 90 per cent alcohol has been found convenient at the color laboratory. Variation in alcoholic content between 88 and 92 per cent has no appreciable influence upon measurements, but wider variations should be avoided. Solvents containing lower proportions of alcohol may be employed. The effect of minor variation in composition, however, becomes more marked with decrease in alcoholic content.

The employment of 90 per cent alcohol has proved advantageous in another respect. Aqueous solutions of basic dyes have a decided tendency to deposit dyebase on the surface of containing flasks and absorption cells.[5] The phenomenon is influenced by the composition of the glass and the nature of its surface and by the hydrogen-ion concentration of the solution. With some basic dyes it may cause annoyance and give rise to appreciable errors in the spectrophotometric evaluation of aqueous solutions. With Safranines I have frequently observed a decrease in extinction coefficients of about 10 per cent over a period of forty-five minutes arising from this cause. In alcoholic solutions, on the other hand, the adsorption of basic dyes is invariably negligible.

[5] Roberts (1910), Hyg. Lab. Bull. No. 66, p. 89.





The employment of 90 per cent alcohol is recommended, accordingly, in the spectrophotometric evaluation of dyes which undergo tautomeric alteration, with variation in concentration in aqueous solutions and of basic dyes in general. Its universal use is not advocated, although it is doubtless satisfactory with a great many dyes. In general, the question of the best solvent and the further question of its buffering or "regulation," in instances in which such regulation is essential, should be decided for the individual dye by comparative tests.

FALL WOOLEN COLORS ANNOUNCED

Fifty new colors have been especially created by the Textile Color Card Association for the woolen industry. These colors are shown on a separate card known as the 1926 Fall Season Woolen Color Card of America and is officially endorsed by the American Association of Woolen and Worsted Manufacturers.

This is the first time that a separate and distinct woolen card has been issued. It is the outgrowth of conferences held last December by the association with its New York woolen members representing thirty of the leading woolen manufacturers and jobbers, to determine whether or not a special woolen color card would be of value to the industry. The response was unanimously in favor, and a committee was officially appointed by Edward S. Johnson, president of the association, to select the colors.

All members of the association have received the advance cards, and the colors have met with unqualified commendation. Red wine shades, greens, rosy tans and browns, and frosty blues are particularly favored.

"Chemistry and Laundry Procedure" was the topic of an address by H. B. Robbins of the Procter & Gamble Company, before the Massachusetts Laundry Owners' Association, April 2, in Horticultural Hall, Boston.

Foreign Dyes Imported Through New York and Other Ports During March

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS OF MANUFACTURERS' NAMES

1—THE SIX LEADING GERMAN COMPANIES

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873.
B—Badische Anilin-und-Soda-Fabrik, Ludwigshafen-on-the-Rhine. Founded 1865.
By—Farbenfabriken, vormals Friedr. Bayer & Co., Leverkusen-on-the-Rhine. Founded 1862.
C—Leopold Cassella & Co., Frankfort-on-the-Main. Founded 1870.
K—Kalle & Co., A. G., Biebrich-on-the-Rhine. Founded 1870.
M—Farbwerke, vormals Meister Lucius & Bruning, Hochst-on-the Main. Founded 1862.

2—THE SMALLER GERMAN COMPANIES

BK—Leipziger Anilinfabrik Boyer & Kegel, Furstenberg. near Leipzig. Founded 1882.
CG—Chemikaliewerk Griesheim G. m. b. H., Griesheim-on-the-Main. Founded 1882.
CJ—Carl Jager G. m. b. H., Anilinfarbenfabrik, Dusseldorf. Founded 1823
GrE—Chemische Fabrik Griesheim-Electron, Offenbach-on-the-Main. Founded 1842.
L—Farbwerk Mulheim, vormals A. Leonhardt & Co., Mulheim-on-the-Main. Founded 1879
tM—Chemische Fabriken, vormals Weiler ter Meer, Uerdingen-on-the-Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—SWISS COMPANIES (ALL AT BASEL)

DH—Farbwerke vormals L. Durand, Huguenin & Co. Founded 1871.
G—Anilinfarben-und Extract-Fabriken, vormals Joh. Rud. Geigy. Founded 1764.
I—Gesellschaft fur chemische Industrie. Founded 1885.
S—Chemische Fabrik, vormals Sandoz & Co. Founded 1887

4—DUTCH AND FRENCH COMPANIES

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888
NF—Niederlandische Farben-und-Chemikalienfabrik Delft, Delft, Netherlands. Founded 1897.
CN—Compagnie Nationale de Matieres Colorantes et Produits Chimiques. Founded 1917. (Etablissements Kuhlmann merged with this company in 1923.)
P—Societe Anonyme des Matieres Colorantes et Produits Chimiques St. Denis (formerly A. Poirrier). Founded 1830.

5—ENGLISH COMPANIES

Bro—Brotherton & Co., Ltd., City Chambers, Leeds.
BAC—British Alizarine Co., Ltd., Manchester
BD—British Dyestuffs Corporation, Ltd., London.
Cl Co.—The Clayton Aniline Co., Ltd., Clayton, Manchester.
CV—The Colne Vale Dye & Chemical Co., Ltd., Milnsbridge, Huddersfield.
Hol—L. B. Holliday & Co., Ltd., Huddersfield.
Scot—Scottish Dyes, Ltd., Grangemouth.

FOREIGN dyes imported through New York and other ports during the month of March totaled 487,804 pounds with an invoice value of $435,891, as compared with 527,964 pounds at $488,501 in March, 1925. The total imports for the first three months of 1926 were 1,157,290 pounds with an invoice value of $1,097,161, as compared with a total for the same period of last year of 1,305,207 pounds valued at $1,213,145.

Dyes and Intermediates Remaining in Bonded Customs Warehouse

	Coal-Tar Dyes and Colors (pounds)	Coal-Tar Intermediates (pounds)
July 31, 1925	775,916	1,378,837
August 31, 1925	767,431	1,363,760
September 30, 1925	709,381	1,359,717
October 31, 1925	609,750	1,055,241
November 30, 1925	521,238	746,226
December 31, 1925	633,525	758,618
January 31, 1926	703,159	763,409
February 28, 1926	596,154	855,170

Five Leading Dyes, by Quantity, Imported During March, 1926

	Pounds
Vat Blue GCD (single strength)	26,378
Ciba Red R Double Paste (single strength)	22,042
Rhodamine B Ex. (single strength)	16,575
Ciba Scarlets (single strength)	14,021
Alizarine Blue SWR (single strength)	13,220

Per Cent of Dyes by Country of Shipment

	1926		
	March	Feb.	Jan.
Germany	48	53	27
Switzerland	34	31	50
France	3	5	11
England	6	3	6
Belgium	4	4.5	3
Canada	2.5	0	1
Italy	2	3	1
Holland	0.5	0.5	1

The dyes in this report are grouped by both Colour Index and Schultz numbers, and in the case of those which could not be identified by either number, the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single strength basis.

DYES OF COAL-TAR ORIGIN

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
32	182	Brilliant Sulphon Red 10B—(S)	500
40	58	Chrome Orange R—(DH)	55
44	56	Nitrosamine Red Paste—(IG)	500
104	—	Metachrome Olive Brown G—(A)	500
119	100	Eosamine G—(IG)	25
127	118	Brilliant Geranine B—(By)	100
134	125	Diazine Black G—(IG)	200
150	144	Orange S—(IG)	200
173	—	Metachrome Violet B—(IG)	200
195	177	Milling Yellow O—(IG)	2,000
196	175	Acid Ponceau E—(G)	220
219	—	Eriochrome Flavine A Conc.—(G)	1,102
225	194	Thiazine Red RXX—(B)	300
278	—	Chlorantine Fast Red 5BL—(I)	882
288	256	Sulphon Cyanine G—(IG)	1,058
291	259	Croceine Scarlet 10B—(By)	50
307	265	Acid Milling Black B652—(G)	2,204
316	273	Diaminogene Blue NA—(C)	1,156
317	274	Diaminogene Extra—(C)	9,500
324	—	Diazo Brilliant Scarlet ROA—(IG)	200
325	—	Diamine Brilliant Violet B—(C)	462
326	279	Benzo Fast Orange S, WS—(By)	600
338	—	Chlorazol Violet R—(BD)	500
382	319	Chloramine Red B, 3B—(S) Diamine Scarlet B—(IG)	2,809
422	348	Diphenyl Brown GS—(G)	551
430	—	Polar Red G—(G) Polar Red R—(G) Polar Red RS—(G)	4,409
436	358	Chlorantine Red 8BN—(I) Chlorantine Red 8BS—(By) Aceto Purpurine 8B—(A)	1,339
449	364	Diazo Brilliant Black B—(IG)	948
451	366	Delta Purpurine 5B—(IG)	1,000
459	373	Congo Orange R—(A) Diamine Orange F—(IG)	1,831
561	449	Trisulphon Brown B Conc.—(S)	2,204
590	471	Chloramine Blue 3G Conc.—(S)	493
593	474	Diamine Green B—(IG)	10
631	14	Diphenyl Chrysoine GC—(G)	4,927
636	19	Fast Acid Yellow 3G—(C)	244
645	—	Kiton Fast Yellow 3G—(I)	1,652
649	26	Triazogene Orange R—(IG)	100
658	496	Rhoduline Blue 6G—(IG) Setoglaucine—(G)	651
661	498	Turquoise Blue G—(IG)	100
667	503	Erio Viridine B Supra—(G) Poseidon Green SGX—(IG)	1,602
670	505	Light Green SF Yellow Shade XX—(IG)	500
671	506	Erioglaucine A—(G) Erioglaucine AP—(G) Erioglaucine EP—(G) Erioglaucine X High Conc.—(G)	8,817
677	512	Magenta Powder AB—(IG)	1,000
681	516	Crystal Violet Extra—(IG)	1,000
699	531	Erio Cyanine AC—(G)	1,102
704	536	Alkaline Blue HR—(A)	25
705	537	Methyl Silk Blue, New—(G)	110
707	539	Water Blue, Large Lumps—(IG)	1,000
710	541	Direct Brilliant Blue 8B—(I)	220
712	543	Kiton Pure Blue V—(I) Patent Blue V—(IG) Poseidon Blue BGX Conc.—(IG)	1,720
714	545	Poseidon Blue BR Extra—(IG)	2,500
715	546	Cyanol Extra—(C) Xylene Cyanole FF Conc. Extra—(S)	1,320
723	554	Chromazurol S Conc.—(G)	551
724	555	Aurine	336
727	557	Chrome Violet—(G)	110
728	558	New Victoria Blue B—(By)	100
729	559	Victoria Pure Blue BO—(IG)	1,000
733	562	Brilliant Wool Blue FFR Extra—(IG) Acid Blue RBF—(I)	1,602
735	564	Alkali Fast Green 3G—(IG) Erio Green B Supra—(G)	2,304
749	573	Rhodamine B Extra (s. s.)—(B) Rhodamine B Extra (s. s.)—(I)	16,575
762	—	Chromorhodine BR—(DH)	441
786	—	Aurazine G—(G)	220
788	603	Acridine Orange DHE—(DH) Brilliant Acridine Orange A—(DH)	4,847
793	606	Patent Phosphine G—(I) Phosphine 3R—(IG)	4,161
797	608	Patent Phosphine RRDX—(IG)	1,200
802	—	Quinoline Yellow KT Extra Conc.—(IG)	500
815	618	Thioflavine—(C)	500
828	672	Azo Carmine GX—(B)	2,393
829	673	Rose Induline 2B Bluish—(IG) Rose Induline 2B Bluish—(K)	940
833	—	Wool Fast Blue BL—(By) Wool Fast Blue BL—(B) Wool Fast Blue CL—(IG) Xylene Milling Blue AE Conc.—(S)	3,918
845	687	Methylene Heliotrope Extra—(IG)	100
865	700	Nigrosine GF—(IG) Nigrosine T—(B)	880
868	705	Indocyanine B—(IG) Indocyanine B—(A)	3,100
875	923	Fur Blue Black A—(A) Fur Blue Black SDF—(IG) Fur Brown 4R—(M) Fur Brown NZD—(IG) Fur Brown PR—(IG) Fur Brown SKG—(IG) Fur Gray B—(M) Fur Gray G—(IG) Fur Olive 3G—(IG) Fur Yellow 6B—(IG)	875
878	622	Brilliant Delphine Blue B—(S)	2,002
879	—	Chromazurine E—(DH)	441
882	625	Modern Heliotrope DH—(DH)	220
824	627	Chromacetine Blue S Extra—(DH) Modern Cyanine V—(DH)	907
892	635	Modern Violet—(DH)	1,764
894	637	Gallamine Blue Extra—(G)	4,916
905	645	Gallazine—(DH)	441
924	660	Methylene Green G Extra Conc.—(S) Methylene Green W—(G)	2,705
926	661	Thionine Blue G—(I) Thionine Blue GO—(IG)	1,602
931	667	Indochromine RR Conc.—(S)	500

(Continued on page 271)

Proceedings of the American Association of Textile Chemists and Colorists

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FEBRUARY MEETING OF THE NORTHERN NEW ENGLAND SECTION

The Northern New England Section of the American Association of Textile Chemists and Colorists held a very interesting meeting at the Engineers Club, Boston, on Saturday, February 27. About forty members and guests attended.

H. Morton Hill spoke on the subject, "Rhea, Oldest and Newest of Textile Fibers," illustrating his talk by exhibiting numerous samples of Rhea fiber in various forms.

Mr. Robinson, adviser to the Chinese Government, also briefly addressed the meeting.

The meeting was adjourned to an informal gathering at 8 o'clock.

A. K. JOHNSON, *Secretary.*

Chairman Bannan—Gentlemen, we are rather late in starting, and as I have neglected to mention to Mr. Hill, our speaker of the evening, that we wish to get away before 8 o'clock, I am going to ask him to speak about one-half hour, after which I want you to ask as many questions as possible regarding his interesting subject, Rhea fiber. I am sure after Mr. Hill has finished telling us about it we will find it a subject well worth looking into further.

In our company we handle a line of artificial silks and real silks, and are always on the watch for any new fiber, so that we may know all that it is possible to know about the demands of our industry. You are all equally interested, and I therefore take great pleasure in introducing Mr. H. Morton Hill, president of Barstow, Hill & Co., Boston investment bankers, who will speak on the subject of "Rhea, the Oldest and Newest of Textile Fibers." Mr. Hill.

Rhea, Oldest and Newest of Textile Fibers

By H. MORTON HILL,
President, Barstow, Hill & Co.

It is a pleasure to be here to-night to talk to you on a subject that is very near to me. It is also an honor to be asked to speak before a body of textile men such as yourselves, especially when you know that my work is in the investment banking field rather than in the textile field. I hope that you will not press me too hard on technicalities because I am in that category rather than a textile man, but I hope, however, to answer satisfactorily any of your questions, as my experience during the past four years has enabled me to gain a fairly comprehensive idea of the Rhea fiber and its uses as it pertains to the textile industry. This through the medium of the work done by the Rheabat Corporation.

When Mr. Sampson requested me to speak and asked what the subject was going to be, I naturally said "Rhea Fiber," but to create interest, I have changed it around so that my subject now stands, "Rhea, Oldest and Newest of Textile Fibers."

It may seem strange that there is being manufactured at the present time a fiber which at the same time is the oldest and newest of textile fibers. Nevertheless, this is an established fact. It is the oldest, because if we study

the history of Rhea back to the time of the ancient Egyptians we find these people, thousands of years ago, actually clothed themselves in a fiber which we can safely say was Rhea. A friend of mine from California and a technical man of considerable ability, made a very extensive trip through Egypt, India and China in the interests of the Rheabat Corporation, and he brought back with him cloth taken from some of the mummies which date back many thousands of years ago. We have had that fiber analyzed microscopically. It corresponds exactly to the Rhea we are manufacturing to-day.

Many have the idea that this fiber is a native of China, but we find that thousands of years ago this fiber was transplanted into China, and has been cultivated there quite extensively. We have reason to believe that this fiber was really a native of Egypt, and it is grown there in large quantities to-day. It was probably transplanted from Egypt into India, and large areas now grow on government land, especially in the section known as the Garo Hills.

There is a great difference between the ancient and the present day methods of preparing Rhea fiber. In China to-day there is a mill which has been running for some fifty years, and they still use the ancient processes of preparing the fiber which were employed centuries ago. Chinese women do most of the labor, and can be hired for a few cents a day. Six hundred Chinese women sit around a pool of water in which Rhea fiber has been soaking over a several months' period. They separate these fibers by hand. The production of these 600 women amounts to but 100 pounds per day, which accounts for the high price of so-called "grass cloth" sold in the stores in China of some $2.25 per lineal foot.

Such information as has come to hand indicates this same method is employed in Egypt. Recently I was talking with a prominent Egyptian cotton importer of Boston, whom perhaps some of you gentlemen may know, and he stated that his father was a cotton raiser and had a plantation of considerable acreage. To shield the cotton from winds and severe atmospheric disturbances, windbreaks of Rhea fiber are used, and this is made from materials grown in Egypt which are identical with those formerly used by the Egyptians in the manufacture of mummy cloth. The natives that work on the plantation prepare this fiber by soaking it in the River Nile for three or four months, and then bring it ashore, ret it out according to the old hand methods, and weave the crude, basket-like fabrics. This importer also said he had caught many a fish from the River Nile on a fish line made of this same fiber. Such a fish line would possess great strength, and he hopes that he will see the day when Rhea fiber will come into its rightful place in the broad field of textiles.

Varieties of Rhea Fiber

Regarding the fiber itself, there are in the main three varieties, all with many grades and qualities:

1. Ban Rhia or Wild Rhea.
2. Boehmeria Tenacissima, known as Ramie.
3. Boehmeria Nivea, known as Rhea.

The first variety, Ban Rhia, our chairman has spoken of; this fiber grows in the more tropical countries and is suitable for twines and things of that sort, although in a few instances a fair grade of cloth has been made from it.

The second variety, Boehmeria Tenacissima, is what is commonly known as Ramie. This is an excellent fiber, but it is not comparable with any of the Rhea fibers that we have to-day. I might say that when we first took up this proposition it had been turned down by all the banking houses in Boston. Every textile man, as soon as the fiber was discussed with him said, "This is another Ramie proposition," and then threw up his hands and refused to have anything more to do with it. I had made up my mind that the Rhea proposition was one of merit. I personally spent some $12,000 looking into the matter to determine the real value of Rhea. We determined to see this thing through in spite of this prejudice. Our stand has proven to have been well founded as textile men generally have had a complete change of attitude, and to-day openly admit the wonderful merits of this remarkable fiber.

Rhea is derived from the so-called third class of stingless nettle fibers, Boehmeria Nivea, and this material seems to be exceptionally well suited for the production of medium and fine grade yarns and pieces. You might be interested to know that of the three classes of fibers, the Rhea class is the least of the group in tensile strength. The first class, Pan Rhia, has a breaking strength of 340 against the second, known as Ramie, of 320, as against the third class of Rhea at 250. Notwithstanding this fact, the Rhea fiber has many other characteristics which more than make up for the difference in breaking strength for textile purposes.

For the moment I would like to discuss the characteristics of this fiber as determined by our experiments during the past few years, but before so doing I would like to call your attention to a peculiar fact which has always interested me.

The Chinese, as you know, usually do things somewhat backwards to the European manner of accomplishing results. We write to the right and across the line, whereas the Chinese write downward and to the left. Our guest of honor sits on the left. The Chinese guest of honor sits on the right. When we go into mourning, black is the conventional color. With the Chinese, it is white. So, our Rhea from China possesses Chinese at-

tributes, for if you place a sliver of Rhea fiber in water and watch the unwinding of the fiber, you will observe that it unwinds to the left, whereas the same fiber from any other part of the world will unwind to the right.

Rhea has another very unusual property in that it is practically completely resistant to mildew. One of New England's leading mill agents made some experiments for us at the time of our initial investigation, and to test this fact he placed a bunch of cotton and a bunch of our carded fiber in a damp spot in the dyehouse. The cotton mildewed badly within a few weeks, whereas the Rhea remained in the same place for about nine months without having been affected in any way. At our plant we placed some degummed Rhea fiber on the ground for one year, and allowed it to remain through the winter storms, snow, spring rains and summer sun, and even after this extreme exposure of a year's period you cannot break that fiber to-day. I am sorry that I neglected to bring this exhibit with me, as it is most interesting.

Use in Wool Mixtures

Microscopic examination of Rhea will show it to be considerably different from Ramie. Looking at the end of it, the Ramie fiber is shaped like a figure eight, being a hollow tube depressed in the middle, and the fiber itself on the outside has nubs or rings at regular intervals. This latter property is of special significance as it is due to these nubs that it cards and mixes so well with wool, as the barbs on the wool seem to fasten into the nubs giving them a very intimate physical mixture; and due to this fact, 25 per cent of Rhea mixed with wool will increase the strength of the wool mixture 40 per cent. Textile experts have repeatedly told us that Rhea is the only vegetable fiber which mixes perfectly with wool, and while I do not speak with any disparagement of artificial silk, wool mixtures of Rhea are very much stronger, quite as lustrous and far better working than wool and artificial silk mixtures.

Most of you realize that the chemists of other countries have also been working on this fiber. A German product, Saladonia, is made from one of the nettle fibers by a special process, and there is also a similar product produced in France, as well as in Belgium. We presumed the German process would cause us the most trouble in competition, and a very thorough study of it has been made. The result of our investigations convince us that their costs of preparing are considerably higher than ours.

Despite the great difference in labor cost in Germany and here, our process is so efficient that we feel no appreciable worries at the present time as regards competition from this source.

The efficiency of our process over that of our competitors is due entirely to the efforts of our chemist, D. E. De Lape, who is the inventor of the process which we use. Mr. De Lape has been extremely enthusiastic over this entire proposition, and has worked on it continually for the past thirty years. I cannot imagine myself working on one problem for such a length of time, but Mr. De Lape has been gifted with that quality of "stick to it," and, as usual, has been rewarded with exceptional results. A professor of chemistry in one of our leading technical schools declared that had Mr. De Lape been trained in any school of chemistry in the world he would not have discovered this valuable process, because what he has done is unknown in any present day text-books in chemistry.

Mr. De Lape has also been working on other fibers and has achieved quite remarkable results. In the Northwest each year thousands and thousands of tons of flax straw is burned, as there seemed to be no economic way of utilizing it. Chemists for years had been concentrating on this fiber and I believe some use had been found for it in the paper industry. Mr. De Lape, from his experiments, finds that for less than a cent a pound he can take flax straw and convert it into a fine workable flax fiber, suitable for the making of good commercial linen yarns.

I have business in Montreal from time to time—not the kind of business you may think of, but a lumber business—and through this means met one of the leading textile men of Canada. Upon showing him some of the results of our flax proposition, he became so interested that a man has been sent down to the plant and they are following us very closely on its development.

Strength and Elasticity

You will be interested to know that Rhea is seven and one-half times the strength of cotton and seven times the strength of silk. It has, however, about one-half the elasticity of cotton, so that it could not be a substitute for other fibers in all respects. This difference in the two factors renders it far superior in some things but somewhat poorer for others.

A great many tests have been made on Rhea of a durability nature owing to its extreme tensile strength, and one of the largest electrical concerns in this country has been interested in its possibilities. A few of their figures are as follows:

Rhea was tested against hard cambric.
At 80 deg. Cent. (about 170 deg. Fahr.):
In oil after 20 days: Cambric, 65 per cent; Rhea, 97 per cent remained.
In air after 20 days: Cambric, 72 per cent; Rhea, 122 per cent remained.

At 100 deg. Cent. (about 212 deg. Fahr.):
In oil after 20 days: Cambric, 19 per cent; Rhea, 67 per cent remained.
In air after 20 days: Cambric, 32 per cent; Rhea, 94 per cent remained.

It will be noted that the Rhea actually increased in strength after twenty days in air at 80 deg. Cent.

Undoubtedly a good many of you have raised questions in your own mind regarding a source of supply of this fiber. At present we are securing practically all from Chinese sources, and of course have to contend with the Chinese method of doing business. In China the farmer raises the grass and sells it to the storekeeper; the storekeeper sells it to a compradore; the compradore through the medium of some bank sells it to the importer, and the importer sells it to us. In this way, five profits are taken before it gets in our hands, and the sum total of these profits is quite sizable. We hope, however, to overcome this situation as we have a representative operating in China, who will buy direct and supervise the gathering and shipping. By this we hope and expect to materially reduce our cost on raw material.

Rhea (after degumming), will absorb some 20 odd per cent of moisture, although only about 15 per cent of weight is lost in our degumming process. A British corporation has been formed, known as the Nivea Company. Money for this has been supplied by interests closely affiliated with the Rheabat Corporation. The purpose of this is to systematize the handling of this product with an idea of standardizing quality and reducing costs.

As stated, Egypt, India and China are the main sources of supply for Rhea, even though it is very easily raised. The British Government in India conducted experiments on Rhea fiber, and within two years time converted them into two million plants. The rapidity of growth of this plant is quite marvelous. In India you can produce about five corps a year. Three months after planting the first root of Rhea the first crop is taken; the second about two months and a half later, and so on. In China, due to climatic conditions, there are only about three crops a year. We are already experimenting on the feasibility of raising this fiber in our Southern States, and while considerable success has been met the main trouble is one of high cost of labor, as we cannot compete against the Chinaman who will work for a few cents a day.

Uses in Textile Manufacture

To bring home specifically to you the real values of this fiber, I have a complete range of exhibits from the crude fiber to the manufactured material, and an examination of these products will convince you of the qualities and uses of Rhea. As you textile men can get more real knowledge from examination of these samples than I may be able to put in words, I hope you will come up and look these over, and also ask any questions which you may desire regarding them. Before reaching the "open forum" stage, I want to read to you a few of the more important uses as we have found them. First, I have brought along a pair of my own golf trousers which were made out of the first cloth manufactured of this material. This is a Rhea filling and a cotton warp. I have worn these trousers during the last three years and they have been laundered exactly eighty-six times. That is quite a test and shows the fiber to have unusual weaving qualities. The Lonsdale people put out a fabric made entirely of Rhea under the name of "Lonsdale Rhea," and some of their fabrics have been laundered as many as 150 times for test purposes, and no appreciable weakening has been shown. In case some of you are not interested in golf trousers we have another pair which are made of 100 per cent Rhea that will interest you. (Holding up paid of child's pants.)

Other uses are as follows:

It is admirably suited for blending with silk on account of its luster. It is largely used in France for this purpose.

On account of its long fiber it can be used as a substitute for wool, especially as it is more like wool than any other plant fiber.

It can be substituted for fine linens, damask table cloths and napkins, gentlemen's shirts, collars and cuffs, and fine linen generally.

It resists dampness very well and imparts non-shrinking properties to wool when blended with it.

It is stated to possess valuable hygienic properties to a degree which is unknown in other textile fibers.

On account of its absorbent qualities it dyes fast and washes well, taking the same dyes as cotton.

Its heat-resisting qualities makes it a factor in engine packings, dynamos and electrical motors.

Its wearing qualities make it suitable for slasher cloths.

Its absorbent and non-shrinking qualities make it particularly adaptable for underwear and knitted wear generally, also medical wrappings.

Its strength and rot-resisting quality make it valuable for fire hose.

Rubber and water-proofing goods will be well served on account of its resistance to heat. The vulcanization at times rots the cotton now used.

Plushes and excellent dress goods can be made from this fiber.

The noils which contain such long fiber can be worked up again and spun into cheaper yarns which can be used

for many purposes, such as carpet yarns, cloths, woolen mixtures and shoddy mixtures.

Rhea has perhaps received greater attention after the great war on account of the shortage of flax and a suitable substitute was much wanted.

The British Empire Flax Association officially pronounced in 1920 Rhea fiber to be the best of all fibers as a substitute for flax. Laboratory tests have shown the great superiority of this fiber over many others now in use. Strength as compared to other fibers is:

Rhea, 80; hemp, 36; flax, 25; silk, 13; cotton, 12.

The length of Rhea filaments range from 2½ to 18 inches, against flax of 1/16 to 2½ inches.

In elasticity: Rhea, 60; flax, 66, hemp, 15; cotton, 100.

Cordage spun from the fiber has sustained 252 pounds, as against 84 pounds required by the British Government Dockyards.

I thank you, gentlemen, for the close attention you have given me, and sincerely hope my subject has been of interest. Now I would like your questions and shall gladly answer them to the best of my ability.

Chairman Bannan—Just a moment, gentlemen, before we have the open forum, as I find there is with us a gentleman of much interest to us, who can also give us some first hand information on the fiber which we are discussing.

Mr. Robinson, adviser to the Chinese Government, is here and will say a few words on jute, Ramie and Rhea. Mr. Robinson.

Mr. Robinson—I am not going to make a speech or attempt to add anything to that which you have received to-night, but it is a subject in which I am interested, as for a number of years I have been connected with the Ministry of Agriculture, as well as in business in China.

The feature that I am particularly interested in is this: it is absolutely useless for you or anybody here to attempt to create an industry without arrangements being made for scientific cultivation of the plant, and I am glad to hear the speaker to-night say that it is being done to some extent in China. I have made quite a study of Ramie where it is grown and have never seen a tract of one acre under cultivation. Generally the piece of land is smaller than this room, and as thousands of farmers are cultivating a patch of about that size, you can readily understand the difficulty of getting a reliable supply of this material under such conditions. It is, therefore, absolutely necessary that the scientific growth and gathering of this plant should be arranged, and I have no doubt such arrangements will be made, for the fiber is extremely interesting, and I know manufacturers will become sufficiently interested in it to take steps to that end. Such efforts will have to be made by private interests, as little or no help can be expected from the government in China, as to-day there is no government there. That may sound rather radical, and perhaps somewhat extravagant, but for years I have been adviser to the Central Government, and from my knowledge of their activities can really say there is no government, and it would be useless to expect them to undertake the systematizing of industry. As I have mentioned, the only thing to do is to get together and see that the development is carried out under scientific and economic supervision.

One of the most troublesome things that was always before us in our foreign organization was the fact that the Chinaman who gathered this grass didn't care how many varieties he got into the same bale. How many I am not able to tell. There are, however, over sixty varieties of this fiber in China, to my knowledge, and undoubtedly these were fairly well represented even in the same package.

All that gathering and cultivating will have to be studied very carefully, and while it would seem possible to cultivate that fiber in America where those conditions can be remedied quickly and easily, it is rather doubtful if such will be feasible owing to the high cost of labor.

I thank you, Mr. Chairman and gentlemen, for this opportunity to say a few words on this most interesting subject, and am particularly pleased that this fiber is being considered seriously, and wish it all the success in its future development. Thank you.

Discussion

Chairman Bannan—We are certainly glad to have heard from Mr. Robinson, and now we will proceed with the open forum. I am sure Mr. Hill will be pleased to answer any and all questions, and I should like very much to hear from you as I am sure there are many questions of paramount interest to the textile man that have already entered your minds.

Mr. Griffin—I am very well aware of the virtues of the fiber, very much interested in doing all that I can (which is next to nothing, perhaps) to see the business launched in a vigorous fashion, and believe that there hasn't been a more opportune time to cultivate this fiber than now, and I think the possibilities will attract very much more public interest now than it would on other occasions where everything is done for show. I would like to ask the speaker just how far they have gone in China in avoiding this mixture of grasses. Is there anything like a stable supply, and is anything being done toward a source of fertilizing this plant, as I understand the ground has to be well fertilized.

Mr. Hill—Because of the difficulties of which Mr. Robinson spoke, we looked around for a man with sufficient botanical knowledge to go to China and study gathering conditions. Mr. Byrne, formerly connected with the American Importing Co.—and also a Mr. J. O. Hayes—

co-operated with the Chinese agriculturists, and made a complete survey of the situation. Copies of their reports are on file in our office. As a result of their activities, the grass we get to-day from China is absolutely uniform, as at present we are not handicapped by their merchandising on gathering procedures. Of course, in the future, we hope to go further into the cultivation and systematizing, and that is what our Mr. Byrne is going to attempt. Frankly, very little has been done to date on the systematizing, but we have made our start. It is essential to the industry that this be done. Mr. Byrne is certainly systematizing the gathering, and it is no small proposition to do that.

Mr. Christison—There are just two points that I would like to know: one is regarding this right and left twist. Will that differentiate the difference of the product?

Mr. Hill—Most all vegetable fibers will twist to the right, for instance, cotton. One experiment was made on some fiber we got from Egypt, apparently just like our Rhea; that fiber when wet would go this way, and Rhea would untwist that way; I don't know whether it has anything to do with a difference, but I brought out the point merely because it is extremely interesting.

Mr. Christison—If the material were hung in the air for some time, do you think it would absorb more moisture?

Mr. Hill—I am sure it would absorb very much more. Rhea is extremely absorbent, and for underwear it is greatly preferred over cotton. To illustrate, take a piece of cotton and put it in water and it is quite a long time before it goes to the bottom. Rhea, on the contrary, goes to the bottom like a stone.

(Mr. Hill tried this out in a glass of water, and the Rhea fiber being very absorbent, sank immediately.)

Mr. Christison—How long is the fiber in that particular top that you have on the table?

Mr. Hill—It is not over five or six inches long. Made up into yarn it would be made on the worsted spinning system. This worsted spinning system, such as is being used, is a combination of the French worsted system and the linen system. It isn't a straight worsted system.

Mr. Cady—Do you make tops that are suitable for combed wool?

Mr. Hill—Yes, they have been made. We sold it in that form, put it with some wool and made a fiber-worsted yarn. Make it 40 per cent and run it through your worsted machinery. I have a wool spun yarn that is a 100 per cent fiber. In connection with this I will show you a piece of goods that is being manufactured for workingmen's apparel. Now this consists of 50 per cent fiber and 50 per cent wool, but it was put into this man's mill without any readjustment of machinery whatever, and it doesn't cost near as much as wool. Here is something rather interesting: A piece of goods made up as a sort of duck; you have no idea of the amount of strength it would take to tear it.

Mr. Brown—How does the affinity for dyestuffs compare?

Mr. Hill—Same as cotton.

Mr. Claflin—What are the geographical limits of the growth in China and the United States?

Mr. Hill—I think that would be a very nice question to have Mr. Robinson answer.

Mr. Robinson—I should say that this growth covers a territory of from Philadelphia west to the Pacific Coast. It is at least 2,000 miles west and perhaps 5,000 miles south in China. There is plenty of land there to produce in large quantities if proper attention is given to it. In America there are just about the same limits. However, it is not possible to raise this plant in this country profitably, as the Chinese labor averages about 10 cents a day against three or four dollars that we have to pay.

Mr. Cady—What is the price of this fiber as compared with cotton and wool?

Mr. Hill—We have had several hundred thousand pounds of this fiber, and the highest priced fiber has been 16 cents, and the average price that we are purchasing this at is 12 to 15 cents; we have the idea that through this company operating in China under Mr. Byrne we will be able to cut out some of these profiteers and get the fiber at less cost. There are grades of this fiber that we believe we could get into this country for 6 cents per pound, and they will be just as suitable, especially for wool mixes.

Mr. Moran—Does it cost more to spin this Rhea fiber than worsted or cotton?

Mr. Hill—I think you will all agree that the worsted spinning system is a more expensive one than the cotton; therefore, as the Rhea is spun on the French and linen system, it is naturally going to be somewhat more expensive than cotton.

Mr. Moran—What is the wearing quality?

Mr. Hill—It will outwear cotton many times.

Mr. Goullard—Is there any duty on it?

Mr. Hill—Not yet.

Mr. Bannan—My impression is that the Ramie, when put on the market some twenty years ago or so, had very poor working qualities.

Mr. Hill—It did for this reason: that they never properly degummed it, and it contained foreign matter. You will find that this fiber as we prepare it to-day is 97-98 per cent pure cellulose, which is pretty nearly perfect. This will not crack even if the yarn is creased.

Mr. Griffin—I think our president is quite well versed in textile matters and has some interesting figures on strengths and the like of the various fibers. I am sure we should like to have him tell us what he knows about it.

Mr. Bannan—Unfortunately Mr. Johnson isn't here.

Mr. Griffin—Professor Olney is the man I had in mind.

Mr. Bannan—Of course, but I always talk with Mr. Johnson about microscopic data, as he is the man who has been doing that kind of work. Also, I promised Professor Olney I would not ask him to speak, but as you have requested it, I will let Professor Olney make his choice.

Professor Olney—My experience has been mostly with the Ramie of the previous years and I think we all agree that that was unsatisfactory for at least most textile purposes. As you all know, every attempt to launch that resulted disastrously sooner or later, and I think when the proposition of Rhea fiber came out there was a great deal of suspicion that came along with it; but from what Mr. Hill has had to say to-night, and seeing this fiber, it appears to me that it is a much more hopeful proposition. There is one question: He spoke on the price of the fiber as being 16 cents a pound. I would like to inquire as to the form in which it comes.

Mr. Hill—It is packed in bales weighing about 600 pounds. As the market price for the material is, for instance, for completely degummed fiber we are selling that for 35 cents. After that has been carded, the same as the bunch on the table, we have been getting as high as 40 cents a pound.

Professor Olney—From 35 to 40 cents would be a fair price for the material that is already for the manufacturer to use?

Mr. Hill—Yes, and that represents a very handsome profit to us. You will be interested in this I think, Professor, and that is that most of the Ramie processes involve the use of kiers that have to be run under pressure. This chemist, De Lape, was rather an ingenious fellow, and he fussed around and invented an open tank.

Professor Olney—I would like to ask a question but you need not feel obliged to answer unless you so wish. Just use your own judgment.

Mr. Hill—Perhaps I haven't any.

Professor Olney—Is the process of a bacterial or a chemical nature?

Mr. Hill—It is chemical.

Professor Olney—Is the cloth which you spoke of as coming from the Lonsdale Company 100 per cent Rhea?

Mr. Hill—Yes, sir. I would like to have you examine it.

Professor Olney—In bleaching, how does the process compare with that for cotton?

Mr. Hill—In bleaching I will illustrate, though not with exact figures. The same bleach is used that you use on cotton, only in a very weak solution. This solution is so weak that we will say it is 1/82 as weak or as strong as what you use in cotton. It is something like that, but do not consider that accurate. As a matter of fact, this fiber can be degummed without any bleach, and then put through an ordinary laundering process. When this cloth was first made, cotton warp, I bought eight or ten yards of it and my wife had a suit made of it; at that time it was more of a gray color, but now it is practically pure white; laundry processes bleached it out. This suit has been made over three times to fit the different styles.

Professor Olney—When I spoke of the bleaching, I referred more particularly to the whole operation of boiling with alkali, as well as the treatment with chemic.

Mr. Hill—I am sorry, but I am not qualified to answer that question.

Mr. Claflin—As I understand it, there is very little loss in the degumming process.

Mr. Hill—About 15 per cent from the weight of the fiber, making it about 80 per cent pure cellulose. They have tried this experiment a good many times at the plant, and were as careful in weighing as they could be in a rather crude laboratory, and that result is approximate.

Mr. Grady—Do they make a practice of oiling this stock before carding it?

Mr. Hill—For certain purposes I do not think it is necessary. A lot has been carded without oiling.

Mr. Moran—Is that piece on the table in the sliver form bleached?

Mr. Hill—Yes, sir.

Mr. Moran—It does not seem nearly as white as the top.

Mr. Hill—Of course, you will understand that it is just as it comes, all matted together, and if you separate it and get the filaments, you will find they are pretty white. Sometimes they get a little rusted but that apparently disappears. Here are samples of yarn for needlework, a sample of needlework made from it, and even part of a bathing suit made from knit goods, although this is the wrong time of the year for bathing. Here is an interesting fabric if you are interested in wool. The concern that was making that particular fabric was using artificial silk waste, and they were using 60 per cent carded wool and 40 per cent silk waste. They substituted carded Rhea fiber for their artificial silk waste and this piece of goods is 100 per cent better than that formerly used. This has stability, it does not wash out as those made of artificial silk, and furthermore, it blends perfectly with wool, as the nubs on that fiber when mixed with the wool grasps hold of the wool, and it thus makes a great combination.

Mr. Nutting—Has any work been done on mercerizing yarn the same as mercerizing cotton?

Mr. Hill—Yes, but nothing to any great extent. There is a certain silk company, one of the largest, that has made some experiments, and produced some wonderful results, but we have not yet reached the point where we

can go into that extensively. We have lines that we are developing to-day that will take our attention for the next year and a half, but there is a great possibility in that.

Mr. Durfee—When the dyestuffs have been applied to this fiber and exposed to the weather, does the keeping quality of the fiber help the dyestuffs to keep thir quality, or does the dye go on fading just the same?

Mr. Hill—I will quote you the opinion of Mr. Milliken who is an expert dye man; I think Mr. Milliken is pretty well versed on the subject. He tells me that this fiber will draw the dye on more permanently than any other fiber that he has ever experimented with. Furthermore, it is so absorbent that when you put a bunch of fiber into a beaker, it is pretty apt to take up all the color and leave it clear.

Mr. Bannan—I think Mr. Davies would like to ask a question of some value. He is interested in one of the other fibers and perhaps he can ask us some questions.

Mr. Davies—I have been requested to ask about the inflammability of this fiber as compared with cotton.

Mr. Hill—It is very inflammable, but will stand a great amount of heat. Experiment shows that under a heat test for thirty days the cotton had entirely disappeared, and the Rhea fiber was 80 per cent of the original strength, but still quite inflammable.

Dr. Davies—Does that cause trouble in the preparing? Will it stand discharges or is it necessary to oil on that account?

Mr. Hill—In the preparation they haven't had any trouble at all. As some of the woolen mills have had trouble, they generally use a little oil, and in a few cases others had to, but you can see it is very inflammable, although it will, on the other hand, stand a great amount of heat.

Mr. Moran—On what condition do the Lonsdale people get their fiber?

Mr. Hill—When the Rhea Corporation was associated, a company known as the National Rhea was formed, and half a million dollars' worth of stock disposed of, but the people interested in the Lonsdale Company formed a corporation known as the National Rhea Corporation. They have a right from the Rhea Corporation to spin yarns on this system (the worsted spinning system) and in turn for that right gave the Rhea Corporation 50 per cent of their stock in 62½ per cent dividends. They in turn sell their yarns to the Lonsdale Company, after which they are sold to Porter in Philadelphia.

Mr. Bannan—Gentlemen, it is now getting to the closing time, and I am going to officially call the meeting to an end. We are very grateful to Mr. Hill for his most interesting and instructive discussion of this new fiber, and I am sure we have all learned and benefited by his explanations. Mr. Hill wishes you all to come up to the tables and look over the various fabrics and materials which he has brought, and feel perfectly free to ask him any further questions that you may care to have him discuss.

MARCH MEETING OF THE NEW YORK SECTION

The regular monthly meeting of the New York Section of the American Association of Textile Chemists and Colorists convened at the Machinery Club, 50 Church St., at 8 o'clock on Friday evening, March 26, Herbert Grandage presiding as chairman.

After the routine business of the Section was transacted, Chairman Grandage introduced the speaker for the evening.

Chairman Grandage—We have had somewhat of a disappointment this evening, in that one of our speakers, Mr. Stieger, has been called to the South on business and cannot be with us. We do feel, however, that Mr. Dort, who is going to present a paper on Celanese, will make it well worth our while to have come here. Mr. Dort has told me that he will be willing and very glad to answer any questions that you care to ask him after the paper is presented.

Mr. Robert G. Dort! (Applause.)

Robert G. Dort—Mr. Chairman and Gentlemen: It is a great pleasure and honor to address you gentlemen tonight on the subject of Celanese and its dyeing, and cross-dyeing. I am doing so with some little perturbation because all of you, I think, are considerably more experienced as colorists and dyers than I am. Nevertheless, I think there are somewhat new developments in the dyeing of Celanese, finishing as well, which I hope will hold your interest.

. . . Mr. Dort then presented his prepared paper:

The Dyeing of Celanese

By Robert G. Dort

American Cellulose & Chemical Mfg. Company

The subject of dyeing Celanese is so well known that I intend to sketch only briefly details of the dyeing methods used. I shall touch briefly on the SRA colors and their properties and also mention briefly some of the other dyestuffs which are being used on Celanese. The major portion of my time I intend to put on cross dyeing and on some of the newer developments in the dyeing, finishing and processing of all Celanese fabrics and of mixed Celanese fabrics, such as simile printing and the high luster effect which we have called Ciré.

You are all well aware of the fact that Celanese brand yarn is cellulose acetate. These yarns are therefore wholly different chemically, and in many of their physical properties from the regenerated cellulose yarns.

The crux of the production of Celanese is the making of stable cellulose acetate of uniform quality day in and day out. Since cellulose is a complicated compound of the formula of $(C_6H_{10}O_5)n$ of an unknown molecular weight, the possibilities of substitution and addition products are large. Exactly as there are possible several cellulose nitrates, there are possible a number of cellulose acetates. The production of the absolute stable cellulose acetate of which Celanese is made, can be said to be a real chemical triumph and this with only a feeling of justifiable pride. I can tell you, gentlemen, it is a difficult job to make a stable cellulose acetate day in and day out, I repeat, of the same uniform quality, which, after fifteen years, won't break down.

I am going to discuss here only those properties of Celanese yarn which are of interest to the dyer and finisher.

It is well to mention first the evenness of Celanese yarn. This is due directly and wholly to the process by which the yarn is manufactured which in turn is largely dependent on its chemical composition. Celanese brand yarn is more even than real silk and our production tolerance in denier size is only 2½ per cent. This means that with fabrics made of Celanese the dyer and finisher will have no trouble with streaky or uneven dyeing.

Owing to its chemical nature, Celanese fabrics are susceptible to the most widely varying finishes under accurate control, both with regard to hand and luster. I shall go into this matter somewhat more in detail later on.

Finally, that property of Celanese brand yarn which is perhaps of most interest to dyers, consists of its unique and valuable dyeing properties. As you all know, Celanese is not dyed by the usual dyestuffs. Some basic colors dye Celanese. Others stain it. In a limited sense, Celanese can be dyed with some of the basic colors. I wish, however, to make very clear that the properties of those basic dyestuffs which do dye Celanese are generally entirely different from their properties on other fibers. By this I mean that the fastness of the basic dyestuffs on Celanese is generally entirely different from their fastness on other fibers. In fact, it can be said that the basic dyestuffs should not be used on Celanese except in the most carefully controlled and unusual circumstances, as the fastness of these colors is almost certain to be unsatisfactory on Celanese.

SRA Colors on Celanese

There are many dyestuffs on the market for the dyeing of Celanese. It is not because our company markets the SRA dyestuffs that I say without any question whatsoever that the SRA colors are superior to any others now being offered for the dyeing of Celanese. I want to call your attention to the various samples dyed in the piece, both woven and knitted which bear out my contention. These were dyed on reel machines.

This, gentlemen, is a piece of two-bar warp knitted tricot fabric, 45 denier, all Celanese. This has not been bleached. It has, of course, been finished. The hand on this particular piece has been given with an olive oil emulsion, made with caustic potash and a good grade of olive oil. This you might call the base of these other pieces which I am going to show you dyed.

Here is a piece of the same fabric dyed up. This seems to have gotten split up in some way or other. Here is a piece dyed Saxe, also 45 denier. Here is a small piece dyed Maize. These are not laboratory samples. These are pieces from production propositions which happen to have been dyed at our own plant at Cumberland, Md.

Here is a piece of heavier warp knitted tricot fabric, all Celanese. This was made of 150-denier yarn, two and a half turns, on a two-bar machine, dyed Polo Tan.

I think that some of you here have perhaps tried to dye a good green with the SRA colors and not had much success with it. This doesn't show up very well in this light, but I give you my word that in the daylight this is a beautiful emerald green, and as you will see from the tag it is dyed with SRA Blue IV and SRA Pure Yellow I, with a large percentage of Pure Yellow I compared with Blue IV. It is a relatively new development and we have solved the green problem—a little before St. Patrick's Day. (Laughter.)

Here is a piece of all Celanese satin made of 75-denier yarn in both warp and filling, five turns in the warp—sized warp, of course—two and one-half turns in the filling. This is dyed a color that we have christened Feu de Bengal, which I think is rather nice.

This is a piece of the same fabric, dyed a cross between a pink and an orange. I want to emphasize again, gentlemen, that these are production propositions which I shall go into a little more fully later.

Here is the same fabric dyed black with SRA Black IV developed with beta-oxy-naphthoic acid.

Here is still another one dyed a brilliant orange, which we have called Messidor. I think in the sunlight this color almost puts your eye out. And here is an interesting thing that I want to show you. This was done quite by accident, but as I put this over the table it hit this glass of water, and I am going to improve it still more. I want you to take note of this because this is of importance in connection with matching. It is highly important when you are dyeing Celanese fabrics to be sure that the samples which you cut to see how your color is coming out are dry. That (indicating) is simply a spot of water on this fabric, and although perhaps it doesn't show up so much in this light, in the daylight that will be practically red. In other words, Celanese fabrics when wet

show an even greater difference in color than do many other kinds of fabrics.

Finally, here is a twill or surah, made of 150-denier, finished in white. This is a heavy fabric, which is, I expect, going into linings. Here is the same fabric dyed black.

These fabrics which I am passing around, gentlemen, are all Celanese, selvedege, warp and filling. Most of these fabrics are dyed on a reel machine, you might be interested to know.

As you probably are well aware, the SRA dyestuffs are 10 per cent pastes and are dyed directly (with the exception of the black which is a developed color) from an olive oil soap bath made up with approximately 1½ grams of olive oil soap per liter and ¼ gram soda ash in soft water. In this connection I call your attention to the fact that the soda ash content should not be more than 2 per cent on the weight of the Celanese for ordinary bath volumes. Otherwise you may possibly saponify your goods and thereby change the chemical composition of the Celanese, losing the valuable dyeing properties.

For dissolving the SRA dyestuffs, a boiling soap solution is advised and filtering into the dye bath through cotton cloth. In the dye bath itself you will find a free use of Celascour (4 to 8 c.c. per liter) of assistance in penetration and level dyeing.

I would like to say, in connection with the solution of the SRA dyestuffs, the only one you really need to watch is Pure Yellow II. That goes into solution with rather more difficulty than the others, and although this filtering into the dye bath isn't perhaps absolutely necessary, we advise it not only in that case but in all other cases, as well.

One important point to be remembered in the dyeing of Celanese yarn or fabric is that thorough scouring and wetting out is essential. This may be accomplished in a scouring bath containing 1.5 grams of olive oil soap per liter, ¼ gram of soda ash per liter and 2 to 6 c.c. of Celascour per liter for one hour, rinsing in warm and cold soft water before dyeing. Generally, it is not necessary to bleach. For very pale or very brilliant shades, it is better to bleach. This may be done with 0.25 deg. Tw. solution of sodium hypochlorite or, if you desire, 2½ c.c. of 50 Tw. solution of sodium hypochlorite may be added to the soap bath when the bleaching will proceed at the same time as the scouring. An antichlor treatment should then be given, consisting of ½ to 1 gram of soda bisulphite per liter of bath for fifteen minutes cold.

Generally speaking the dyeing temperature should be around 75 deg. Cent. which is approximately 170 deg. Fahr. In certain instances a lower temperature would be required and the temperature gradually raised. I might stop a minute to say that—I don't know exactly how to express it, but let us put it this way: the temperature at which the SRA colors go on the goods with a rush is generally in the vicinity of 170 deg. Fahr. We expect to get out some more accurate information than we have yet published on the varying temperatures for the different colors in that connection.

All the SRA colors with the exception of the blacks may be mixed as desired to produce compound shades. The American Cellulose & Chemical Manufacturing Company already has a very considerable service formula file for various shades and is prepared to match any colors submitted in a short space of time, furnishing the recipe to the dyer.

Dyeing of Black

I want to call your attention to the dyeing of blacks on Celanese We recommend SRA Black IV which gives —in dyeings of 15 to 20 per cent—a deep rich jet black. The dyeing takes place at 175 deg. Fahr. for 1½ hours. The fabric will come out of the black dye with a brownish orange. The goods should be thoroughly rinsed.

The material is then diazotized for one-half hour cold in a bath containing 5 per cent sodium nitrite and 16 per cent 28 deg. Tw. (1.14 specified gravity) hydrochloric acid. This bath should be only about one-half the volume of the dye bath, that is to say about 15:1. If a longer volume is used in the diazotizing bath, the strength should be proportionately increased.

The goods are thoroughly rinsed; then developed with beta-oxy-naphthoic acid at a temperature of from 35 to 60 deg. Cent. (95 to 150 deg. Fahr.) for one-half hour and then at 60 deg. Cent. (140 deg. Fahr.) for one-half hour. Please note that the development is done hot. The bath should contain 2.5 per cent beta-oxy-naphthoic acid, 0.6 per cent caustic soda, 3.0 per cent glue and 3 per cent acetic acid (100 per cent). Then the goods should be given a light soaping.

In the dyeing of black on Celanese, it is important that the diazotizing bath should not be too low a concentration. Furthermore, the fabric should not be allowed to lie around after diazotizing and before developing. It is also important that the acetic acid be added to the developing bath and the fabric fully developed. The omission of any of these points will cause a reddening of the black.

In the dyeing of Celanese the maximum temperature for dye bath should never exceed 175 deg. Fahr. unless it be desired to deluster the Celanese or unless the luster be protected, as will be mentioned hereinafter.

In general the fastness of the range of SRA colors is exceedingly good, considering the brilliancy of the colors. It is probably safe to say that for colors of such brilliancy the all-around fastness is better than in any other range. There are, of course, variations in fastness between

colors. The following colors from the SRA range are fast enough to light for the highest guaranteed demands:

SRA Golden Orange I
SRA Golden Orange III (a new color)
SRA Red VII (a new color)
SRA Heliotrope I
SRA Violet II
SRA Blue III
SRA Blue IV
SRA Golden Yellow X (a new color)
SRA Black IV (developed with beta-oxy-naphthoic acid)

The SRA Golden Orange III, SRA Red VII and SRA Golden Yellow X are three new colors which will probably be on the market within a month.

Cross-Dyeing Celanese

Since Celanese is not dyed by the use of direct and acid dyestuffs, if these are pure, the most brilliant contrasting and cross-dyed effects can be obtained in one bath on fabrics composed of Celanese mixed with cotton and rayon, or real silk or wool.

The SRA colors, when properly applied, leave cotton and rayon completely clean. Some of you may have cross-dyed cotton with Celanese, using the SRA colors on the Celanese, and found the alternative fiber somewhat stained. I want to draw your attention briefly to one or two precautions when dyeing such mixtures to leave cotton or rayon white.

Use a minimum amount of SRA dyestuffs to bring the Celanese to shade and if you are dyeing a deep shade on the Celanese add the SRA dyestuffs in portions so that it will not flush onto the cotton and rayon mechanically. Be sure that in the dye bath there is plenty of olive oil soap and Turkey Red oil. We suggest that there should be used at least 1½ grams of olive oil soap per liter in the dye bath and 3 c.c. Turkey Red oil per liter. Enter the goods at 160 deg. Fahr. and raise the temperature immediately up to 170 deg. Fahr. at which they should be dyed. This will give cleaner results than if the goods were dyed cold.

Finally, if the cotton or rayon has been stained when the Celanese is dyed with SRA Orange I, Red I, Red III or Red V, the alternative fibers may be bleached out in a soap bath containing 1 gram of sodium hydrosulphite per liter and 0.2 grams of soda ash per liter.

In cross dying Celanese mixtures in one bath you will have found that some of the direct and acid dyestuffs stain Celanese. This is due to the fact that many of the darker colors in the ranges of direct cotton dyestuffs and also some acid dyestuffs contain basic shading impurities such as Chrysoidine.

The Celanese selects the basic dyestuffs from such a mixture. This is the case with a certain well-known black which is being used with great success in one Southern hosiery mill. This mill cross-dyes Celanese cotton hosiery in one bath with this color, the cotton coming out a deep jet black and the Celanese a bright golden orange. To avoid such staining on Celanese, it is only necessary to obtain specially selected direct and acid dyestuffs which might be called pure colors, i. e., which have not present basic shading impurities. Such dyestuffs can be obtained not only from ourselves but from National, Newport, Du Pont, Dyestuffs Corporation of America and probably some other dyestuff house, some of which already have out shade cards showing the Celanese non-staining properties of their colors.

I might also hand around some of these cross-dyed effects. Here is a piece of cotton Celanese brocade. This is rather an old sample. I am sure many of you have seen it. It is woven in the gray, cross-dyed in one bath, the Celanese gold, the cotton blue.

Here is an unfinished bit which I dyed up in a hurry the other day. The Celanese is gold; the cotton is a lavender.

Here is an interesting piece of drapery fabric, containing four fibers. The blue, shiny fiber is Viscose; the yellow is Celanese; the background is made of cotton and real silk. This piece of fabric was cross-dyed in two baths, the Viscose and cotton dyed blue, and the Celanese yellow in one bath, and then the real silk filled into a somewhat deeper yellow in a second bath. This doesn't show up very well in this light.

Here is another bit of fabric dyed a light blue and red. Here is a drapery fabric made of Viscose and Celanese, the Viscose dyed red and the Celanese left unstained.

This is something a little more complicated. This is a fabric made of a black dyed cotton warp, with Celanese and Viscose in the filling, natural color, cross-dyed red and green in one bath.

Here is the same effect, only the Celanese and Viscose have been cross-dyed red and yellow. This is a larger piece of that which I am passing around there.

I am going to say just a word about the cross-dyeing of Celanese-wool fabrics. You will find the SRA dyestuffs stain wool and real silk in certain instances. When properly dyed, this is never sufficient to prevent brilliantly contrasting effects, and if it is desired to leave the wool or real silk clean it can be cleared up in a bleaching bath, which I will refer to a little later.

In the cross-dyeing of Celanese-cotton and Celanese-wool fabrics, it is advisable and in certain cases necessary to boil the dyestuffs owing to the cotton or wool fibers This may be necessary for reasons of fastness and penetration.

Unless precautions are taken, Celanese will be delus-

tered by boiling. The luster on the Celanese can be protected by the use of large amounts of Glauber salt in the direct or acid dye bath. The procedure which is recommended is as follows:

Enter the mixed goods into the direct cotton dye bath at a temperature not in excess of 180 deg. Fahr. and dye until the bath is very nearly exhausted with the addition of the usual amount of Glauber salt. When the dye bath is nearly exhausted, add an extremely concentrated solution of Glauber salt to the dye bath, a solution concentrated enough so that the Glauber salt content of the resulting bath will be 30 per cent by weight of the amount of dye liquor present. Raise the temperature of the dye bath to boiling and boil one hour. The luster on the Celanese should be unaffected. If it be desired to boil only one-half hour, a somewhat lower percentage of Glauber salt can be used. For one hour's boiling, the solution should contain approximately 2½ pounds of Glauber salt per gallon of dye liquor—about 30 per cent by weight.

After this dyeing rinse off the goods and fill in the Celanese to shade in a second bath at a temperature not in excess of 175 deg. Fahr.

You will note that where it is necessary to boil the mixed fabric and still retain the luster on the Celanese that a two-bath method must be employed.

There are various ranges of dyestuffs for the dyeing of Celanese on the market. These are Setacyl, Celit, Ionamines, Duranol, etc., colors. In passing it may be of interest to know that Setacyl direct powder dyestuffs for use on Celanese have achieved considerable success in the dyeing of hosiery in various Southern mills and probably elsewhere.

Hosiery Dyeing

With regard to Celanese hosiery dyeing, the question of penetration of cotton tops, toes and heels is of course of great importance. It is not to be denied that there has been some little difficulty in obtaining this in rotary dyeing machines at the restricted temperature of 180 deg. Fahr. We are able to say that this problem has been thoroughly solved, partly by the use of direct colors selected particularly for their penetrating and leveling powers and partly through the use in the dye bath of relatively large quantities of Celascour, as much as 10 c.c. per liter. In this connection you will find that the use of Celascour improves greatly penetration and leveling and only slightly slows up the speed of dyeing.

Of course, if it is necessary to boil the cotton colors, a two-bath method such as described above for cross-dyeing can be used. The use of a dye bath ratio 20:1 is advised, but satisfactory results have been obtained on Celanese hosiery with a dye bath ratio as low as 10:1 and even lower.

The Celanese interests are about to publish a booklet containing complete information concerning the dyeing of Celanese hosiery which we hope will be of material assistance to dyers so engaged.

With regard to machines which can be used, experience in England and in this country has shown that for piece goods a reel or winch machine can be used with satisfactory results. In the winch machine, when the fabric is loose in the dye bath, the use of Celascour in the dye bath will be of assistance. The dye bath itself should be of wood, enamel ware or copper, with the obvious exception that copper must not be used for diazotizing bath.

Before I go on with the question of printing and finishing, I should like to mention that we expect to publish presently a booklet containing full details of cross-dyeing Celanese mixed fabrics with the Indanthrene colors. In this instance, extremely fast results can be obtained on both fibers. The Celanese would be dyed with one or more of the selected range of SRA colors which I have referred to before. The alternative fiber is to be dyed with a specially selected range of the Indanthrene colors which will be published in our booklet, selected for their properties of leaving Celanese white.

The method is a patented two-bath method, the property of our company and released for free use on fabrics containing Celanese brand yarn. In the process the vat colors are applied by using, instead of alkali, sodium phenylate or other phenol-like derivatives, but usually sodium phenylate. These salts have a very much reduced tendency to hydrolize Celanese. The dyeing should take place between 100 and 125 deg. Fahr. and with the specially selected vat colors, no staining of the Celanese should result. The goods are rinsed and the Celanese filled in with the desired shades in a second bath with the above selected colors from the SRA color range, especially fast to light.

I should like to emphasize again the fact that thorough wetting out of fabrics containing Celanese is essential to level and easy dyeing. As had been said before, the use of Celascour has distinct value in this respect.

In passing, I think it may be of interest to those of you who are dyeing fabrics containing both Celanese and real silk in the gum to know that we have a method of degumming real silk in the presence of Celanese without boiling. This method will be released by the company free of charge to interested parties.

In general, the question of dyeing Celanese is now no more difficult than the dyeing of cotton with direct colors. By this I mean not only that skein dyeings and laboratory tests can be easily and simply accomplished, but that this statement holds true for the dyeing of goods in the piece

on the production basis where evenness and trueness is at all important.

Finishing—Controlling Luster

I want to say just a word about finishing. The luster on Celanese can be controlled chemically within a range between this piece of completely delustered all Celanese fabric here and this piece of high luster Messidor satin. Both are all Celanese and of approximately the same construction. Along with that piece of twill, I would like to pass this, which is the identical fabric, but differently finished. That fabric is this fabric, entirely delustered. You will have noticed the high luster that can be obtained on that piece of satin. Those two pieces are twills. Complete delustering of Celanese fabric can be obtained by running in a bath containing approximately 2 grams of olive oil soap per liter, 5 c.c. of Turkey Red oil per liter and ¼ gram of soda ash per liter. The bath must be boiling and kept boiling in order to get uniformity of result. The delustering can be complete in about three-quarters of an hour. When I pass this sample around, I ask you to notice the extraordinary hand which it has, combined with a perfect eggshell dullness.

As you feel that sample, please notice the rather extraordinary hand. On close inspection, the cloth looks not unlike a very, very fine count cotton cloth but the hand is entirely different. This is a new development which I think has only been publicly spoken of once before, and that was in the South last week. You will notice that on that delustered piece, the finish is almost a perfect eggshell dullness.

This piece of green fabric here has been calendered between hot calender rolls at a fairly high temperature. The high luster is due to the partial fusing of the Celanese on the surface. This fabric will not spot and has large uses in the millinery and kindred trades. This particular bit of fabric is a Celanese fast cotton back satin. The same effect can be gained on an all Celanese fabric by proper treatment through hot cans. This effect has been called a Ciré effect.

Between these two extremes of eggshell finish and high luster, any degree can be obtained. We generally advise the finishing of our fabrics with a luster somewhat less than this piece of Messidor all Celanese silk which I have here. On a piece of cloth like this, we can obtain a still higher, candy-like luster, if we desire, by hot calendering.

Not only can the luster be controlled in the finishing process, but the hand of Celanese fabrics can also be controlled. If a soft hand is desired, the fabric should be treated with an olive oil emulsion made of caustic potash and good olive oil. If a heavier hand and scroop be desired, this can be given by the use of acetic acid, formic acid or tartaric acid, the last named acid giving probably the harshest crackly scroop and also the heaviest hand. In these two printed bits here I think you can easily feel the difference in hand. This, incidentally, gentlemen, is discharge printing on Celanese knit fabric. This piece has a harsh hand; this one a much softer hand. An Alpaca finish can be obtained on the proper type of Celanese fabrics by the use of gum tragacanth and glue. Creping is accomplished by treating at a temperature of 176 deg. Fahr. for one hour in a bath containing olive oil soap and soda ash, then by boiling in 30 per cent solution of Glauber salt.

Simile Printing

Celanese fabrics can be block or discharge printed. I call your attention to this all Celanese voile, roller printed, which I think you will agree is rather a beautiful article. These samples I have here are discharge printed and block printed knitted all Celanese fabrics. These are production propositions. Various methods of printing are used. That is all Celanese, gentlemen, both ways, and selvedge. It is 75-denier, approximately thirty turns twist, warp and filling. I have here a small bit (most of it has gone to the stenographers in the office, I think) of tricot, block printed in a loud design, but brilliant colors. And here is a somewhat imperfect bit of discharge printing on all Celanese knitted fabric, the same design as the others, but I think rather more attractive in tone. It is merely a question of using colors which will dye Celanese (such as the SRA colors) mixed with British gum and usually steamed carefully. This piece of discharge printed all Celanese tricot fabric shows what can be accomplished by that method.

In this case the Celanese fabrics are first completely delustered by boiling. I have here a piece of Celanese satin made of 75-denier both ways, two and a half turns in the filling, five turns in the warp, similar to that piece of twill which has been completely delustered. It is very difficult to see in this light, but you will see it as I pass it around. This is then put through a printing roll and this damask, almost Jacquard, effect is gained by relustering the fabric locally in the design desired. We get a combination here of very perfect hand and an exceedingly inexpensive method of obtaining the effect desired.

Here is a piece of pink. You will notice the two-color effect which is gained, although there was no dyestuff in the printing paste at all. It is simply a question of where the fabric is lustered and where it is not.

Here is a cotton Celanese crepe; the filling is cotton crepe; the warp is 75-denier five turn Celanese. The Celanese is on the face of the fabric. It has been completely delustered and then simile-printed in this design, which very closely resembles a damascene or Jacquard effect.

Here is the same thing in a blue.

We can do this also on knitted fabrics. This is a piece of the most inexpensive fabric we can make, or which is being made out of Celanese, a circular knit fabric, which has been delustered and simile-printed. You see, we get a two-tone effect on a dyed fabric. Incidentally, gentlemen, the dyeing and delustering can be done in one bath. We don't have to be careful not to boil when we are about to simile print.

We have here two more samples of printed goods. Here is the twill, samples of which you saw plain, made of 75-denier Celanese warp and filling, printed in Italian blue stripes. This is not simile.

Here is another simile printed bit, but printed in colors, that is, a dyestuff paste, mixed with the relustering paste. If you will look at that carefully as it is handed around you will see that the background has the eggshell finish.

Finally, here is a simile printed bit, a satin, 75-denier, all Celanese, which is simile-printed in two colors, the background being an eggshell finish. Some of you, I know, will criticize the register on this bit, but it is a piece which has just come in in two colors. This is quite the latest thing, I can assure you, that we have accomplished. This hasn't been in the office for over forty-eight hours.

This process will be released by the company in the near future to those printers who have orders for simile printings on Celanese goods. It is simple and inexpensive and the chemicals involved can be obtained in the American market and are manufactured here.

I have taken more time than I intended, but I trust that you will feel free to inspect any of these samples which I have. I believe it is customary to have questions and although I am sure that I shall be unable to answer many of those you ask, I shall endeavor to do my best.

Discussion

Chairman Grandage—Are there any questions you would like to ask Mr. Dort?

Mr. Scott—What is Celascour?

Mr. Dort—Celascour is a scouring material which we market under that trade name. It is a substance which acts very well on Celanese. (Laughter.)

Mr. Baxter—You spoke of a Southern plant dyeing a black and a yellow on cotton and Celanese, with the same black dyestuff. I have had a little experience with that, and I have had two explanations given to me of that effect, one being that it was due to an impurity in the intermediate, and the other being that it was due to standardization of the dyestuff. In either case, I don't see how the shade of the yellow could be controlled. That is, wouldn't there be a tendency to get a yellow in one case and an orange in the next case?

Mr. Dort—You mean from the same dyestuff?

Mr. Baxter—From the same black dyestuff.

Mr. Dort—I would say that if you dyed hose with that dyestuff to-day—I won't say that dyestuff, but any of these direct black dyestuffs we are speaking of—and tried the same thing two months later, it is very likely that the yellow in your hose would be dyed a different shade. I am not competent to say whether it is a question of an impurity in the intermediate, or not, but my impression is that it is probably a question of shading up the dyestuff itself, and therefore it varies according to different batches of the dyestuffs.

Mr. Baxter—It would be impractical, then, except for hosiery, or something of that sort.

Mr. Dort—It would be impractical, except on hosiery, and rather cheap hosiery, where you didn't care to hold your color week in and week out exactly the same.

Mr. Baxter—May I ask still another question?

With reference to that piece of highly lustered green, which is on quite a heavy cloth, with the cotton backing and the Celanese base, was that dyed on a reel

Mr. Dort—That was dyed in a reel machine.

Mr. Baxter—I don't see how it could be done, without running into more or less streaked effects.

Mr. Dort—I don't know, sir.

Mr. Schaumann—Is there any other way of restoring the luster, other than calendering?

Mr. Dort—Yes, within limits, an acetic bath will help a good deal. For instance, this is one method we recommend: that the goods be steeped for three hours in a 20 per cent acetic acid solution in the cold, lifted without washing, and the excess acid removed by good whizzing; then dry in a fairly hot stove, and when dry, any residual acid can be removed by washing in water, followed by a light soaping.

We also recommend sometimes an acetic acid of 25 per cent strength, but reducing the length of treatment to one hour. However, I think it is much better to use the weaker acid wherever you can. Of course, there are certain instances where the luster has been completely taken out, such as in that piece of twill, where that won't do it. That is more for accidental semi-delustering during dyeing. And, of course, calendering won't restore the luster in a piece of fabric which has been boiled to the extent that that has.

Does that answer your question, sir?

Mr. Schaumann—Are those discharge effects accomplished with hydrosulphite?

Mr. Dort—Yes, they can be, and I think these were.

Mr. Scott—Are all SRA dyes dischargeable, with the exception of black?

Mr. Dort—You have me there, sir. I think most of them are, but I really wouldn't like to say positively about all of them. In fact, we are still working on this whole printing problem.

Mr. Scott—Is there any particular aftertreatment, after discharge, other than the ordinary precautions?

Mr. Dort—No, the usual procedure works pretty well.

Mr. Scott—Would you age it after steaming?

Mr. Dort—No, I don't think so. I don't want to be too definite about discharge printing yet. As I say, these are somewhat preliminary samples, but we know it can be done, and we shall be far better prepared in the course of a month or six weeks to give details of exactly how to work it.

Mr. Hirsch—Does the complete delustering have any effect on the strength of the Celanese fiber?

Mr. Dort—Probably not. It may weaken it very slightly but certainly not sufficiently, in a piece of goods like those you are seeing, to make any difference whatsoever in the marketing. Personally, I don't believe it makes two per cent difference.

Mr. Hirsch—Do you think the effect is purely chemical?

Mr. Dort—The effect is wholly physical. If you burned a piece of that fabric you would find it melts just the way Celanese does.

I wonder if you gentlemen are all familiar with the test for Celanese. I meant to have spoken about that. It won't take more than a few seconds. The best test is burning. Of course, Celanese will burn, but you will find it is a melting which is quite different from real silk, but you won't be able to see it very well until I pass this around again (demonstrating). You get a little ball, very much like melted sugar. A fine way to get burned is to do this and put your fingers in this melted cellulose acetate while it is hot; it is as bad as sulphur for sticking.

I think perhaps you might like to look at that, because it is highly important from the dyeing point of view to identify the silk-like fabrics which you get these days.

Mr. Skinner—Isn't that characteristic of other acetate silks?

Mr. Dort—It is characteristic of any acetate silk.

Mr. Hirsch—May I ask if there is any easy way of distinguishing Lustron from Celanese?

Mr. Dort—Not that I know of.

You could perhaps tell by the variation in the way they take the basic colors, but that is a fairly delicate test, sir.

Mr. Schaumann—It isn't positive?

Mr. Dort—No.

Mr. Seitzman—Can you tell me what effect the Celanese thread which has been dyed and knitted into a silk or cotton fabric will have upon dyeing the fabric afterward in a hot soap bath, let us say. Suppose that thread was dyed a golden yellow with one of the SRA colors, how would that shade be affected?

Mr. Dort—In the first place, it would depend somewhat on how it was dyed. If it were one of these eight or nine selected colors from the SRA range that I have mentioned, it ought to stand cross-dyeing perfectly.

You mentioned a golden yellow. The two golden yellows now in the range, VIII and IX, would probably bleed slightly, but this new color which I mentioned, Golden Yellow X, ought to stand up. Of if you had Golden Orange I there, I don't think it would bleed appreciably, even in a hot soap bath.

Mr. Seitzman—Its supremacy would be maintained in a hot soap bath? Let's consider it at 205 deg.

Mr. Dort—You would probably deluster it.

Mr. Seitzman—But the brilliancy of the shade, would that be affected in any way?

Mr. Dort—In this way: whenever you deluster a Celanese yarn, I think it is fair to say you pull down your shade, quite apart from bleeding. I mean to say these SRA colors here are very brilliant on Celanese but if you could dye them on cotton I don't believe they would have the same brilliancy. Similarly, when you change the physical appearance of the Celanese yarn, as you would by boiling, it is difficult to phophesy exactly what would happen to the color from that point of view. I don't think the color would bleed much. I don't think it would go off shade much. I do believe it would lose brilliancy, because the yarn would become dead.

Do I answer your question?

Mr. Seitzman—Yes.

Do you think it would act better than a resisted yarn of silk, let us say.

Mr. Dort—Well, it is hard to say. I am really not prepared to say whether it would or not.

Mr. Seitzman—Resisted yarn will not stand up for too long a time, you know, and the Celanese might. I wonder which would be better in that case.

Mr. Dort—My reply to that, of course, would be prejudiced.

Mr. Seitzman—I also would like to ask this question: Can you tell me about the practicality of knitting a Celanese thread into a cotton-silk hosiery?

Mr. Dort—Yes, in fact, I have hosiery samples here with me which I forgot to show. I really should have shown these in connection with cross-dyeing. Here are hose made out of black-dyed cotton yarn with Viscose plated over. There is the black-dyed cotton yarn, and then horizontal stripes of Celanese, broad and narrow, cross-dyed in one bath. This is being done on a production scale, and I think you will see from that that it is quite a practical proposition to put in horizontal stripes.

I might pass these around. I don't think they are in pairs, so they don't do anybody any good. (Laughter.) These are all Celanese hosiery, made of 150-denier yarn, 26 filaments, two and a half turns; they are circular knit, dyed solid. I would like you to note the labels on these two black stockings as they come to you, if you are in-

terested. This isn't so much a dyeing problem. I would like to have you feel the difference in hand between these two stockings. One of them is made of 150-denier, 26-filament Celanese yarn, the other of 150-denier, 40-filament Celanese yarn, both two and a half turns. These stockings all have cotton tops, heels and toes.

Chairman Grandage—I would like to ask how yarn-dyed Celanese dyed with SRA colors would compare with Indanthrene-dyed mercerized cotton in the skein?

Mr. Dort—To light the fastness would compare most favorably.

Chairman Grandage—It would bleed more than Indanthrene-dyed cotton?

Mr. Dort—Yes, in general; but in many cases the washing fastness would be equally good.

Chairman Grandage—I have seen some fine samples of embroidery yarns that have been made from Celanese fiber, and invariably the fastness trials couldn't stand up to the maximum fastness trial that is established for that, although the usual practice is that ordinary household washing calls for 110 or 150 deg. and a very slight soap solution.

Mr. Dort—Specially fast developed colors on Celanese at present are a light navy and a red and orange yellow. They would stand that test, in addition to the black. I am not prepared to say whether these so-called starred colors of ours of the SRA range would stand it or not, but I think they would come very close to it. The balance of the SRA colors probably wouldn't; that is, probably half of them. I emphasize that *probably* half of them wouldn't.

If any of you care to come up here later, I have here a very ragged looking swatch sample of the self-shades of the SRA colors in one and ten per cent dyeings on all Celanese satin, the complete range. You are quite at liberty to look at those, if you want to.

Chairman Grandage—Gentlemen, are there any more questions? If not, I will entertain a motion for a rising vote of thanks to our speaker.

. . . A motion to this effect was regularly made, seconded and unanimously carried. . . .

. . . The meeting thereupon adjourned at nine-fifteen o'clock.

Applicants for Membership

Active Membership

Courtney, H. C., dyer and chemist, Knoxville Knitting Mills Company, Knoxville, Tenn. Sponsors: Ben R. Dabbs and P. F. O'Neill.

Dean, J. D., superintendent finishing department, Pacific Mills, Lyman Department, Lyman, S. C. Sponsors: L. S. Little and C. B. Hayes.

Diaz, Jr., Jos., assistant dyer, American Printing Company, Fall River, Mass. Sponsors: Ben Verity and A. E. Hirst.

Hornby, Bertrand L., dyer, Ciba Company, New York City, N. Y. Sponsors: A. N. Dana and W. H. Wingate.

Winkler, Adolph J., textile research chemist, L. Sonneborn Sons, Inc., Belleville, N. J. Sponsors: R. R. Sleeper and Alfred Winkler.

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Abbott Jr., W. G., in charge of dyeing, Hillsborough Mills, Wilton, N. H. Sponsors: J. Milton Washburn and D. W. Symmes.

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Donovan, Joseph R., 155 Broadway, Somerville, Mass.
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AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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Vol. XV April 19, 1926 No. 6

A NEW TWIST TO AN OLD STORY

THE American dye industry has been awaiting with well-founded optimism and confidence the Supreme Court decision in the Government's suit against the Chemical Foundation; but an element of suspense is now introduced as it becomes evident that the Mills bill, providing for the payment of alien claims and the return of alien property, will probably be passed by Congress. Secretary Mellon, at a hearing last week before the House Ways and Means Committee, stated that President Coolidge has voiced his approval of this bill and "is in accord with its principles." Its passage was urged before the end of the present session

Section 9 of the Mills bill, covering the return of patents, trade-marks and similar rights at present held by the Alien Property Custodian, reads as follows:

> The Alien Property Custodian is authorized and directed to return to the person entitled thereto, whether or not an enemy or ally of enemy and regardless of the value, any patent, trade-mark, print, label, copyright, or right therein or claim thereto, which was conveyed, transferred, assigned, or delivered to the Alien Property Custodian, or seized by him, and which (1) has not been sold, licensed, or otherwise disposed of under the provisions of this Act, and (2) is not involved (on the date of the enactment of the Settlement of War Claims Act of 1926) in litigation in which the United States, or any agency thereof, is a party.

It should be particularly noted that this section provides protection only for those who obtained their licenses from the Alien Property Custodian. If the Government wins its case in the Supreme Court, the numerous licenses granted by the Chemical Foundation to American dyestuff and chemical manufacturers would evidently be held null and void by the passing of the Mills bill.

If the bill finally goes through—and the Congressional wind seems to point that way—the Supreme Court decision in the Chemical Foundation case, when it is announced, will have a significance far greater in its effect on our dye industry than either of the decisions previously handed down in the lower courts. During the trials there was always some question as to how the patents would ultimately be disposed of, should the Government win its suit. The Mills bill apparently answers that.

The paramount question in the case, however, has always been whether or not the war-time acts of President Wilson, or acts having his official sanction, can properly be open to investigation now. The Supreme Court decision should answer that. If it decides that the sale of the patents to the Foundation was a transgression of administrative power, then the Department of Justice can look forward to an endless series of legal controversies involving every sale of alien property made during the war—in short, to one of the most absurd proceedings in the history of justice.

Inconceivable as it may be that the victory will ultimately go to the Government, a decision which would be a most ironic climax to the case after two scathing defeats in the lower courts, we cannot refrain from observing that when justice hangs in the balance anything may be expected. But we make this observation without intentionally assuming the role of alarmist, for a brief review of the case should convince anyone that only by the grossest perversion of justice could our Supreme Court magistrates reach a decision adverse to the Chemical Foundation.

SAFETY IS NEARING FIRST

NOWHERE does patience reap such well-deserved and worth-while rewards than in accident prevention work—particularly in educational efforts to diminish industrial accidents. The National Safety Council, with headquarters in Chicago, has been most active in the field of industrial safety. It is gratifying to this agency to observe very definite results of their months—nay, years of patient, plodding effort to achieve no-accident records in industry. It should be more gratifying to industry to learn that such encouraging progress has been made, for to industry do the benefits accrue.

The favorable reports have come from both large and small corporations which have been pioneers in accident prevention work. Some large plants have been operated for several consecutive months without accidents. Others have been able to go three or four years. Among the interesting records recently announced is that of the Clark Thread Company, of Newark, N. J., employing five thousand, which can point to a period of 268 consecutive days without an accidental injury, equivalent to about 1,300,000 man-days. At the fuze works of the Du Pont Company 381,000 man-days passed without serious accident, a record excelled only by a period of seven years at the same plant with only one time-losing accident.

Safety education is slowly but surely teaching industry that industrial accidents do not have to happen.

The Textile Section of the National Safety Council has lately organized a committee composed of textile machinery manufacturers, textile employers and workers, State and Governmental authorities, technical organizations and insurance companies, for the purpose of drafting a safety code for the textile industry. Sub-committees have been formed to develop different sections of this code on cotton, woolen and worsted mills and dyeing and finishing. The industry should acknowledge the great importance of this movement by actively co-operating in the work, for, we repeat, the industry will reap the ultimate benefits.

HOWES PUBLISHING COMPANY ACQUIRES INTEREST IN TWO SILK PAPERS

The Howes Publishing Company, publishers of the AMERICAN DYESTUFF REPORTER, has acquired a majority interest in Silk Publishing Company, publishers of "Silk," a monthly publication, and of "Silk Market Weekly Digest," the only weekly in the silk industry, effective May 1.

Walter B. Walker, from whom the purchase was made, will continue to publish "The Rayon Journal," which will be operated by a separate company, the Textile Reporting Corporation. Mr. Walker will become a vice-president and director of the Silk Publishing Company. There will be no immediate change of policy of the combined organization, nor any immediate changes among the personnel.

The Silk Publishing Company has been located at 267 Fifth Avenue. Shortly before May 1 the offices of the two silk publications will be moved to 90 William Street, the present address of the Howes Publishing Company.

The Howes Publishing Company also publishes the "Knit Goods Weekly Trade Record," the only weekly in the knit goods industry.

RESEARCH PLANS DISCUSSED AT SILK ASSOCIATION ANNUAL MEETING

One of the important projects brought out in the annual report of the Silk Association of America, presented to its members by Secretary Ramsay Peugnet at its annual meeting on Wednesday, April 7, was that covering research work on the standardization of raw silk.

"Convinced of the need for fundamental research studies on the physical and chemical properties of silk, for which leaders of the industry have long agitated," said Mr. Peugnet in his report, "members of the association organized a research fund and oversubscribed a quota of $30,000. This will assure at least three years' work, which, although an excellent beginning, prescribes a very limited period for the amount of study which silk problems to-day require. As the determination of standards for raw silk is one of the most urgent and basic problems in the industry, this was the work in which the fund was first applied."

Recognizing the growing need for more definite information as to the washing virtues of silk, the association appointed a committee to conduct research on the problem and, if they found it advisable, to devise a formula for the ideal washing method, considering the number of times a fabric could withstand this test without noticeable change of color or injury, in order to be properly called washable or washfast. So many phases of the question were opened up in the preliminary studies, Mr. Peugnet said, that the committee was soon compelled to limit its work to the consideration of silks intended as washable and so labeled.

The annual report also emphasized the great advantages secured by removal of the association's headquarters to larger office space. Among other activities coming under the functions of the association, this report touched upon study given to Government specifications for silk articles; the elimination of waste in silk manufacture; the preparation of a cost accounting manual for silk throwsters; the progress made in sericulture during the past year; the protection of trade and consumer rights in the matter of misbranding, and the work of the Missing Properties and Traffic Bureaus.

ARBITRAL AGENCIES MERGED

On February 1, 1926, the activities of the Arbitration Society of America, Inc., the Arbitration Foundation, Inc., and the Arbitration Conference were taken over by the American Arbitration Association, which was created on January 29 by an order of consolidation signed by a Justice of the Supreme Court of New York. The new association has established offices at 342 Madison Avenue, New York.

The consolidation order designated Lucius R. Eastman, Henry Ives Cobb, Anson W. Burchard, James H. Post, Frank H. Sommer, John F. Fowler and Felix M. Warburg as the directors to serve until the first annual meeting on April 30. At that time a full board of directors will be selected and the officers chosen for the ensuing year. All directors of the three consolidating organizations are serving on the council of the association which has taken over all the memberships, correspondence and other assets and activities of the older groups.

A program is now being perfected to maintain an information and consultative service to trade associations interested in creating or developing their own arbitral machinery and in promoting the general use of arbitration among their members in business disputes. A feature of this service will be the preparation and distribution of information bulletins on various phases of the practical functioning of commercial arbitration. Joseph Mayper is the secretary of this Trades Division.

The Reduction Products of Azo Dyes

Part XI

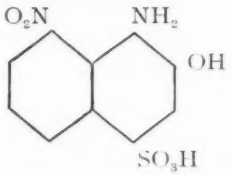
By WALTER C. HOLMES

Color Laboratory, Bureau of Chemistry

[EDITOR'S NOTE.—*The most practical and effective method for the identification of azo dyes consists in the isolation and identification of the products which they yield on reduction. This method finds less application than it might or should, partly because some of these products have never been isolated and investigated, and partly because much of the data which has been obtained in regard to such reduction products is greatly scattered and very difficult to locate.*

Mr. Holmes has made a search for all the available information on such reduction products, and this series contains a digest of his results with a systematic listing of the reduction products of the azo dyes published in the Colour Index, together with the available data on such properties and reactions as would be of service in their identification.]

No. 124.—5-NITRO-1-AMINO-2-NAPHTHOL-4-SULFONIC ACID



$C_{10}H_8N_2O_6S$; Mol. Wt.; 284.19; (C, 42.2%; H, 2.8%; N, 9.9%; O, 33.8%; S, 11.3%).

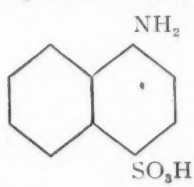
Derived from C. I. Nos. 203 and 204 by partial reduction.

Yellow needles, sol. in alkalies and pptted. by H_2SO_4.

The *sodium salt* cryst. in yellow prism. needles.

The *diazo comp.* is readily sol. in H_2O with a yellow color, and is pptted. by mineral acids in pale yellow crystals which are relatively stable. (For couplings see Friedlander, 7, 673.)

No. 125.—1-NAPHTHYLAMINE-4-SULFONIC ACID
(Naphthionic Acid)



$C_{10}H_9NO_3S$; Mol. Wt. 223.19; (C, 53.3%; H, 4.1%; N, 6.3%; O, 21.9%; S, 14.4%).

Derived from C. I. Nos. 174 to 176, 178 to 188, 231, 232, 235, 306, 318, 561, 570, 577, 597, 600, 602, 608, 609 and 612.

Small, glittering, colorless needles. Very sparingly sol. in H_2O (1 part in about 4,000 at 15°), nearly insol. in alc. Aqueous sols. of the acid and its salts fluoresce blue. The latter give loam colored pptes. with $FeCl_3$, sol. on heating with dark color.

Na salt ($+4H_2O$) large monoclinic prisms, readily sol. in H_2O but insol. in alc.

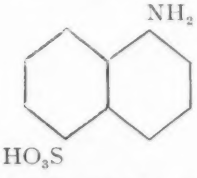
Amide, brown-yellow needles (alc.), mpt. 206°; gives an acetyl deriv., small needles (alc.), mpt. 241°.

Acet-naphthionic acid-ethyl ester, while needles, mpt. 148°; *acet-naphthionic acid-dianilide*, leaflets (alc.), mpt. 231°. Heated with sod. bisulfite and with NaOH naphthionic acid yields *α-naphthol-4-sulfonic acid*. Heated with conc. HNO_3 and poured into water it yields *dinitro-α-naphthol-1, 2, 4*, mpt. 138°. With steam at 180° in 65% H_2SO_4 the sulfonic group is split off at once. It does not form naphthoquinone on oxidation. It forms an azoxy dye on oxidation with warm alkaline $K_3Fe(CN)_6$ which dissolves in hot water with a red-brown color and dyes wool yellow.

It may be converted into *1-chlornaphthalene-4-sulfonyl chloride*, mpt. 95°, and into *1, 4-dichlornaphthalene*, mpt. 67-8°.

[For absorption data on the dye obtained by diazotizing and coupling with 1-naphthol-2-sulfonic acid, see J. Assoc. Off. Agr. Chem., 6, 16 (1922).]

No. 126.—1-NAPHTHYLAMINE-5-SULFONIC ACID
(Laurent's Acid)



$C_{10}H_9NO_3S$; Mol. Wt. 223.19; (C, 53.3%; H, 4.1%; N, 6.3%; O, 21.9%; S, 14.4%).

Derived from C. I. Nos. 177, 307 and 601.

Microscopic needles. Sol. in 950 parts H_2O at 15°; rather easily sol. in hot H_2O. Sols. of the acid and its salts fluoresce green.

Na salt ($+1H_2O$), leaflets, sol. in alc. and in H_2O.

Zn salt ($+9H_2$), flat needles, rather diffic. sol. in H_2O.

Amide, glittering plates (alc.), mpt. 259-60°; gives an acetyl deriv., mpt. 231-2° and a diacetyl deriv., mpt. 200°.

Its *diazo deriv.* is yellow.

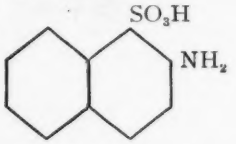
With bromine water it gives an intense violet color quickly turning cherry-red and fading.

On acetylation and sulfonation it gives *1-naphthylamine-5, 7-disulfonic acid*.

It may be converted into *1-chlornaphthalene-5-sulfonyl chloride*, mpt. 95°, and into *1, 5-dichlornaphthalene*, mpt. 107°.

On boiling with nitric acid it yields *2, 4-dinitro-α-naphthol*, mpt. 138°.

No. 127.—2-NAPHTHYLAMINE-1-SULFONIC ACID (Tobias Acid)



$C_{10}H_9NO_3S$; Mol. Wt. 223.19; (C, 53.3%; H, 4.1%; N, 6.3%; O, 21.9%; S, 14.4%).

Derived from C. I. Nos. 189 and 190.

Sparingly sol. in H_2O, crystallizing in anhydrous leaflets from hot H_2O and in efflorescent hydrated needles from cold H_2O. The pure ammonium salt does not fluoresce (in sols.).

Na salt ($+1H_2O$), letflets, readily sol. in H_2O.

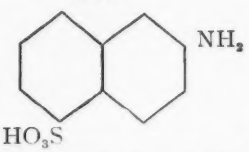
The *diazo comp.* is nearly insol. in H_2O and separates in sulfur-yellow cryst.

The amino group of the acid may be replaced by chlorine by the Sandmeyer method. The resulting *2-chlornaphthalene-1-sulfonic acid* gives a chloride, plates, mpt. 76°, and an amide, mpt. 153°.

By distillation with P_2Cl_5 *1, 2-dichlornaphthalene*, mpt. 35°, is obtained.

The sodium salt is converted into *sodium-2-naphthylsulfamate* by heating to 230°.

No. 128.—2-NAPHTHYLAMINE-5-SULFONIC ACID



$C_{10}H_9NO_3S$; Mol. Wt. 223.19; (C, 53.3%; H, 4.1%; N, 6.3%; O, 21.9%; S, 14.4%).

Derived from C. I. Nos. 191, 196 and 312.

Long, fine white needles. Sol. in 1,300 parts cold H_2O and in 260 parts of boiling H_2O.

Na salt ($+5H_2O$), colorless transparent plates which effloresce in air, turning yellowish. Sol. in 10 parts hot 95% alc.

Sols. of the salts fluoresce red-blue.

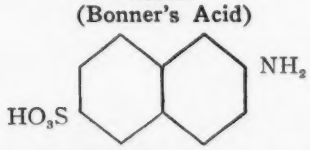
The *diazo comp.* is a microcryst. green-yellow pdr. Coupled with *α-naphthol* it gives a red dye, turned blue-violet by HCl; coupled with *β-naphthol* it gives a red-orange dye, fast to acids.

It may be converted into *2-chlornaphthalene-5-sulfonyl chloride*, mpt. 76°, and into *1, 6-dichlornaphthalene*, mpt. 48°.

On fusion with KOH at 260-70° it gives *2-amino-5-naphthol.*

With ethylnitrite it gives *α-naphthalene sulfonic acid.*

No. 129.—2-NAPHTHYLAMINE-6-SULFONIC ACID (Bonner's Acid)



$C_{10}H_9NO_3S$; Mol. Wt. 223.19; (C, 53.3%; H, 4.1%; N, 6.3%; O, 21.9%; S, 14.4%).

Derived from C. I. Nos. 192 to 195 and 340.

Prismatic needles or silky plates. Sol. in 630 parts boiling H_2O.

Aqueous sols. of the acid and its salts fluoresce blue.

Na salt ($+2H_2O$), silky needles, sol. in 40 parts cold H_2O.

Ba salt ($+6H_2O$), long, silky needles, sol. in 450 parts cold H_2O.

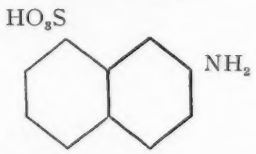
On strong heating the salts give *β-naphthylamine.*

With sod. hypochlorite the sod. salt yields *1, 2-naphthazin-6, 6'-disulfonate*, fine green-yellow powder sol. in H_2O with a yellow color and in conc. H_2SO_4 with a violet color.

It may be converted into *2-chlornaphthalene-6-sulfonyl chloride*, mpt. 109°, and into *2, 6-dichlornaphthalene*, mpt. 135°, bpt. 285°.

The *diazo comp.* is yellow and moderately sol.

No. 130.—2-NAPHTHYLAMINE-8-SULFONIC ACID (Badische Acid)



$C_{10}H_9NO_3S$; Mol. Wt. 223.19; (C, 53.3%; H, 4.1%; N, 6.3%; O, 21.9%; S, 14.4%).

Derived from C. I. Nos. 196 and 312.

Small needles, sol. in 1,700 parts of cold H_2O.

Na salt, large prisms, diffic. sol. in 95% alc.

(The color of the acid is reported as grey-violet, and that of its salts as rose-red by one investigator.)

Sols. of the acid and its salts fluoresce blue.

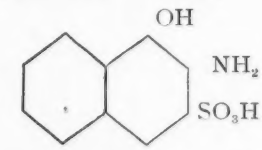
It gives a sparingly sol. green-yllow *diazo comp.*

It gives *2-naphthol-8-sulfonic acid* on boiling with an excess of sodium bisulfite and acidifying.

It gives *2-amino-8-naphthol* on fusion with KOH at 260-70°.

It may be converted into *2-chlornaphthalene-8-sulfonyl chloride*, mpt. 129°, and into *1, 7-dichlornaphthalene*, mpt. 62.5°.

No. 131.—2-AMINO-1-NAPHTHOL-3-SULFONIC ACID (Amino-A. W. Acid)



$C_{10}H_9NO_4S$; Mol. Wt. 239.19; (C, 50.2%; H, 3.8%; N, 5.9%; O, 26.8%; S, 13.4%).

Derived from C. I. No. 127.

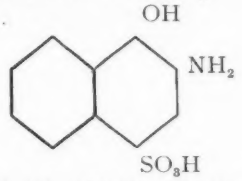
Broad needles, colored reddish in the air.

An ammoniacal sol. in the presence of air gives the characteristic blue "skin" of *naphthoquinonimide.*

Heated with $ZnCl_2$ and HCl to 106-12° it gives *2-amino-α-naphthol.*

The sulfonic acid group is only slightly split off by treatment with sodium amalgam.

No. 132.—2-AMINO-1-NAPHTHOL-4-SULFONIC ACID (Amino-N. W. Acid)



$C_{10}H_9NO_4S$; Mol. Wt. 239.19; (C, 50.2%; H, 3.8%; N, 5.9%; O, 26.8%; S, 13.4%).

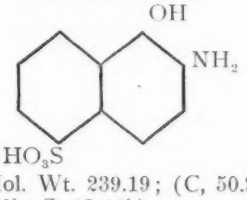
Derived from C. I. Nos. 6, 111, 114, 179, 191, 194, 225, 227, 249, 259, 284, 299, 301, 304, 338, 341, 375, 384, 388, 413, 431, 447, 461, 463, 465, 471, 472, 482, 484, 490, 491, 494, 498, 502, 504, 515, 522, 523, 548, 557, 564, 566, 571, 578, 604, 605 and 613.

Glittering pearly needles and leaflets. Only slightly sol. in cold H_2O, insol. in alc., ether and C_6H_6. The ammoniacal sol. on filter paper turns green on exposure to air and gives a bright terra-cotta spot with conc. HCl. (The green color turns violet and then red on warming, but the green color is restored by NH_3.) The sol. in sod. acetate turns violet on exposure to air. On boiling the acid with a soda sol. (with air current) it gives a violet-black dye.

On oxidation with HNO_3 it gives *β-naphthoquinone-α-sulfonic acid,* which on treatment with an aqueous sol. of aniline gives a characteristic scarlet-red *anilido-β-naphthoquinone,* mpt. 252-3°.

With conc. HCl the sulfonic acid group is gradually split off at 150°.

No. 133.—2-AMINO-1-NAPHTHOL-5-SULFONIC ACID (Amino L Acid)



$C_{10}H_9NO_4S$; Mol. Wt. 239.19; (C, 50.2%; H, 3.8%; N, 5.9%; O, 26.8%; S, 13.4%).

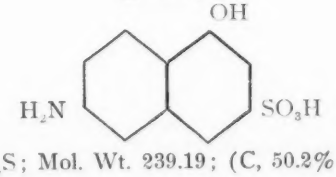
Derived from C. I. Nos. 25, 62, 75, 84, 180, 355 and 503.

Large colorless leaves or long needles, nearly insol. in cold H_2O.

The sulfonic acid group may be split off by the action of sod. amalgam and *2-amino-1-naphthol* obtained.

Diazotized in the absence of free mineral acids and in the presence of copper chloride a diazo oxide is obtained. The barium salt cryst. in green-yellow cryst., gives a gold-yellow sol. and may be coupled with *resorcin* in the cold, giving a deep blue-red dye which gives a red-brown pptte. with HCl.

No. 134.—6-AMINO-1-NAPHTHOL-3-SULFONIC ACID (J Acid)



$C_{10}H_9NO_4S$; Mol. Wt. 239.19; (C, 50.2%; H, 3.8%; N, 5.9%; O, 26.8%; S, 13.4%).

Derived from C. I. No. 325.

The acid is sparingly sol. in H_2O, the alk. salts readily sol. with a blue fluorescence. Ferric chloride gives a brown-black color or pptte.

Anilide, brown powder, diffic. sol. in H_2O and alc. It dissolves in conc. H_2SO_4 with a green color, in dil. soda sol. with a violet fluorescence and in sod. acetate sol. without fluorescence.

The *diazo comp.* of J-acid is yellow and gives a violet product with sodium carbonate sol. The N-acetyl and benzoyl derivatives are not diazotized.

Heated with sod. bisulfite the acid yields a dioxydinaphthylamine disulfonic acid, fine white needles, readily sol. in H_2O. The sodium salt dissolves in H_2O with a weak blue-violet fluorescence.

FOREIGN DYES IMPORTED DURING MARCH

(*Continued from page* 250)

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
969	748	Hydron Blue R (s. s.)—(IG)	333
1027	778	Alizarine VI Extra Pure—(M)	
		Alizarine Paste Bluish—(I)	6,612
1034	780	Alizarine Red S—(B)	
		Alizarine Red W—(By)	1,200
1035	782	Anthracene Brown RD—(G)	
		Anthracene Brown SW—(IG)	2,825
1037	783	Purpurine—(IG)	5,000
1053	—	Alizarine Sapphire Blue SE—(I)	220
1054	858	Alizarine Sapphire Blue B—(I)	
		Alizarine Sapphirole B—(IG)	1,200
1063	790	Alizarine Blue SWR—(IG)	13,220
1075	856	Alizarine Blue AS—(By)	1,156
1076	859	Alizarine Light Blue R Conc.—(S)	500
1077	860	Alizarine Direct Blue BGAOO—(B)	1,000
1080	853	Anthraquinone Violet—(B)	1,024
1085	862	Alizarine Blue Black B—(By)	
		Alizarine Blue Black 3B—(By)	3,102
1087	851	Alizarine Direct Blue B—(IG)	1,000
1088	855	Alizarine Sky Blue—(By)	
		Alizarine Sky Blue B—(By)	2,536
1095	759	Anthra Yellow GC Paste—(IG)	
		Anthra Yellow GC Powder (s. s.)—(IG)	6,381
1096	760	Vat Golden Orange G Dbl. Pst. (s. s.)—(B)	3,872
1097	761	Vat Golden Orange RRT Paste—(IG)	7,229
1099	763	Vat Dark Blue BOA Paste—(B)	2,448
1104	767	Vat Violet RR Extra Paste—(B)	1,316
1106	838	Vat Blue RSP—(IG)	
		Vat Blue RSP Triple Powder (s. s.)—(B)	
		Vat Blue RS Triple Paper Pdr. (s. s.)—(B)	2,400
1109	840	Vat Blue 3G Paste—(IG)	
		Vat Blue 3G Powder (s. s.)—(M)	1,959
1113	842	Cibanone Blue GCD (s. s.)—(I)	
		Indanthrene Blue GCD Dbl. Pst. (s. s.)—(B)	
		Vat Blue GCD Pdr. (s. s.)—(B)	
		Vat Blue GCD Double Paste (s. s.)—(B)	
		Vat Blue GCDN Powder (s. c.)—(B)	26,378
1114	—	Vat Blue BCS Powder (s. s.)—(B)	3,030
1118	849	Vat Yellow G Powder (s. s.)—(IG)	1,240
1128	818	Vat Pink B Powder (s. s.)—(B)	1,645
1132	—	Vat Yellow GK Powder (s. s.)—(By)	800
1135	820	Vat Brilliant Violet RK Pdr. (s. s.)—(IG)	1,600
1136	822	Vat Brilliant Orange FR Pdr. (s. s.)—(By)	
		Vat Orange RF Powder (s. s.)—(C)	
		Vat Orange R Paste—(M)	3,490
1137	824	Vat Orange R Paste—(By)	289
1150	833	Vat Olive R Paste—(IG)	4,000

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
1152	—	Vat Brown G Paste—(IG)	
		Vat Brown G Powder (s. s.)—(IG)	8,000
1162	831	Vat Red BN Extra Paste—(B)	
		Vat Red RK Paste—(B)	6,423
1163	832	Vat Violet BN Paste—(B)	2,004
1169	792	Cibanone Orange R Powder (s. s.)—(I)	4,408
1173	793	Cibanone Blue 3G Paste—(I)	
		Cibanone Blue 3G Powder (s. s.)—(I)	2,396
1174	—	Cibanone Green B Paste—(I)	771
1184	881	Brilliant Indigo 4B Powder (s. s.)—(B)	2,500
1186	883	Indigo MLB 6B Powder (s. s.)—(M)	1,000
1196	890	Ciba Yellow G Paste—(I)	660
1198	891	Ciba Green G Powder (s. s.)—(I)	2,200
1207	912	Anthra Red B Paste—(IG)	988
1211	910	Anthra Pink BN Paste—(B)	
		Helindone Pink AN Paste—(IG)	
		Thio Indigo Rose BN Paste—(K)	2,610
1212	918	Ciba Red 3B Paste—(I)	
		Thio Indigo Red 3B Paste—(K)	
		Vat Red Violet BH Pst. for Printing—(IG)	5,497
1215	914	Helindone Orange D Powder (s. s.)—(IG)	350
1217	913	Helindone Orange R Paste—(IG)	
		Thio Indigo Orange R Paste—(K)	4,122
1227	904	Thioindigo Brown G Paste—(IG)	1,000
1228	907	Anthra Scarlet 2G Paste—(B)	
		Ciba Scarlet G Extra Paste—(I)	
		Thiondigo Scarlet 2G Paste—(IG)	14,021
1229	908	Ciba Red R Double Paste (s. s.)—(I)	22,042
1247	874	Indigo Powder	1,589

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Pure Blue R Supra—(G)	551
Acid Violet 8B Extra—(IG)	200
Acid Violet 3R—(IG)	10
Alizarine Direct Violet ERC—(M)	53
Alizarine Fast Gray 2BL—(By)	203
Alizarine Rubine R—(By)	220
Alizarine Supra Blue A—(IG)	1,005
Alkali Fast Green 3G—(IG)	100
Astra Phloxine FF Extra—(IG)	1,544
Azo Brilliant Red B—(IG)	100
Benzyl Fast Blue L—(I)	221
Brilliant Acid Blue EG Conc.—(IG)	751
Brilliant Milling Blue B—(IG and By)	3,603
Cloth Fast Red 3B—(I)	220
Cloth Fast Yellow G—(I)	331
Fast Acid Marine Blue HBBX—(IG)	200
Fast Black G Conc.—(G)	110
Formyl Blue B—(IG)	10
Guinea Blue A—(A)	500
Guinea Brown 2GL—(IG)	200
Guinea Fast Green 3B—(IG)	200
Guinea Light Blue A—(IG)	500
Guinea Rubine 4R—(IG)	200
Indocyanine B—(IG and A)	3,429
Indocyanine FF—(A)	200
Ink Blue B1TBN Powder—(A)	110
Kiton Fast Red 4BL—(I)	1,102
Leveling Silk Blue B—(IG)	500
Milling Orange G—(IG)	400
Milling Yellow GA—(A)	200
Moti Orange G—(IG)	50
Moti Orange R—(IG)	50
Soluble Blue 2B Extra Conc.—(IG)	480
Sulphon Orange G—(By)	473
Supramine Bordeaux B—(By)	100
Supramine Brown G—(IG)	100
Supramine Brown R—(By)	100
Supramine Red 2G—(IG)	500
Supramine Red 3B—(IG)	1,430
Wool Black BR—(By)	3,547
Wool Blue N Extra—(IG)	25
Wool Blue RRT Extra—(By)	556
Wool Fast Orange G Powder—(By)	485
Xylene Milling Blue AE Conc.—(S)	1,000
Xylene Fast Blue FF Conc.—(S)	727
All other	18

Vat Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Alizarine Indigo 5R Paste—(IG)	400
Alizarine Indigo Brown R Paste—(By)	6,400
Anthra Brilliant Green 5G Paste—(B)	881
Anthra Pink B Extra Paste—(B)	1,000
Anthra Rubine B Powder—(K)	341
Ciba Black G Powder—(I)	110
Ciba Black R Powder—(I)	88
Ciba Pink GB Paste—(I)	3,086
Ciba Pink BG Powder (s. s.)—(I)	2,755
Cibanone Brown R Powder (s. s.)—(I)	1,110
Cibanone Red G Powder—(I)	110
Eridane Brilliant Scarlet B Paste—(IG)	1,500
Grelanone Brown B Powder—(GrE)	48
Helindone Blue 3G Powder—(IG)	100
Helindone Blue 3R Paste—(IG)	110
Helindone Printing Black RD Paste—(IG)	8,500
Hydron Brown G Paste—(C)	2,260
Hydron Brown G Powder (s. s.)—(C)	1,800
Hydron Brown R Paste—(C)	838
Hydron FB Pink Paste—(C)	100
Hydron Scarlet 3B Paste—(C, IG, G)	2,055
Hydron Sky Blue FK Paste—(IG)	900
Hydron Yellow GG Powder—(IG)	200
Hydron Wool Red BB Vat—(IG)	25
Indigosol Violet AZB—(DH)	110
Soledon Jade Green Paste—(Scot)	112
Thio Indigo Black B Paste for Printing—(IG)	3,000
Thio Indigo Brown GI Paste—(IG)	200
Vat Blue RZ Double Paste (s. s.)—(B)	1,826
Vat Brilliant Blue R Paste—(B)	964
Vat Brilliant Violet 3B Paste—(IG)	20
Vat Brilliant Violet 4R Paste—(IG)	10
Vat Brown 2G Paste—(B)	792
Vat Golden Orange 3G Paste—(By)	882
Vat Golden Orange 3G Powder (s. s.)—(By)	800
Vat Green 2G Double Paste (s. s.)—(B)	550
Vat Pink B Double Paste (s. s.)—(B)	
Vat Pink B Powder (s. s.)—(IG)	4,516
Vat Red Brown R Paste—(B)	667
Vat Yellow FFRK Paste—(IG)	441
Vat Yellow GF Paste—(IG)	300
Vat Yellow 3GF Double Paste (s. s.)—(IG)	400
Vat Yellow GGK Paste—(IG)	
Vat Yellow GGK Powder (s. s.)—(IG)	90

Mordant and Chrome Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Alizarine Gray G—(M)	60
Acid Anthracene Brown PG—(IG)	258
Acid Anthracene Brown WSG—(IG)	1,000
Alizarine Light Gray BS Conc.—(S)	3,002
Anthracene Chromate Brown EB—(IG)	1,000
Brilliant Chrome Violet 3R—(DH)	110

Name of Dye and Manufacturer	Quantity (pounds)
Chromanol Black RVI—(DH)	110
Chromanol Blue NR—(DH)	220
Chromazurol B—(G)	650
Chromazurine DH—(DH)	110
Chromazurine G—(DH)	440
Chrome Fast Yellow 2G Powder—(IG)	100
Chrome Printing Claret R—(DH)	25
Chromophenine FKN—(DH)	110
Chromorhodine BN—(DH)	441
Chromorhodine 6GN Extra—(DH)	220
Eriochromal Brown G Powder—(G)	110
Eriochrome Black E—(G)	551
Eriochrome Blue S—(G)	1,102
Erio Chrome Geranol R Conc.—(G)	220
Metachrome Red G—(IG)	200
Naphthochrome Violet R—(I)	441
Radio Chrome Blue B—(IG)	200
Ultra Corinth B—(S)	200

Direct Dyes

Benzo Brilliant Pink G—(By)	100
Benzo Chrome Brown B—(IG)	100
Benzo Fast Black L—(By)	458
Benzo Fast Brown 3GL (IG and BY)	1,760
Benzo Fast Brown RL—(IG)	
Benzo Fast Brown RL—(By)	1,954
Benzo Fast Gray BL—(IG)	1,000
Benzo Fast Scarlet 2GL—(IG)	5
Benzo Rhoduline Red 3B—(By)	500
Brilliant Benzo Fast Yellow GL—(IG)	500
Brilliant Benzo Green B—(By)	496
Brilliant Pure Blue B—(By)	283
Brilliant Pure Yellow 6G Extra—(By)	110
Brilliant Sky Blue 8G Extra—(By)	881
Chloramine Light Gray R Conc.—(S)	114
Chlorantine Fast Blue 2GL—(I)	8,157
Chlorantine Fast Bordeaux—(I)	220
Chlorantine Fast Bordeaux 2BL—(I)	551
Chlorantine Fast Brown 3RL—(I)	2,205
Chlorantine Fast Violet 5BL—(I)	2,204
Chlorantine Fast Violet 2RL—(I)	1,102
Chlorazol Fast Brown RK—(BD)	1,500
Columbia Catechine—(IG)	100
Columbia Catechine G—(A)	500
Cotoneral A Extra—(IG)	500
Developed Brilliant Scarlet 2BL Extra—(By)	496
Developed Light Violet BL—(By)	373
Developed Light Yellow 2G—(By)	277
Developing Blue B—(A)	1,000
Diamine Azo Brown G—(C)	1,198
Diamine Azo Fast Green G—(C)	502
Diamine Azo Yellow 2G—(C)	496
Diamine Brown R—(IG)	10
Diamine Dark Blue B—(IG)	10
Diamine Fast Black C High Conc.—(IG)	100
Diamine Fast Blue F3G—(C)	1,500
Diamine Fast Brown GBB—(IG)	500
Diamine Fast Orange ER—(C)	1,111
Diaminogene BW—(C)	743
Diaminogene GG—(C)	1,448
Dianil Fast Violet BL—(IG)	300
Diazo Brown RW—(I)	330
Diazo Brown SW—(I)	110
Diazo Fast Black SD—(By)	463
Diazo Sky Blue B—(By)	
Diazo Sky Blue—(IG)	1,617
Diazo Sky Blue 3GL—(By and IG)	1,300
Diazogene Orange G—(CJ)	150
Diphenyl Fast Bronze B—(G)	1,102
Direct Cutch Brown GR—(I)	331
Direct Fast Brown 3GL—(By)	551
Direct Fast Heliotrope 2RL—(By)	276
Direct Red 12B	132
Direct Sky Blue 8G Extra—(By)	440
Fast Cotton Brown GB—(A)	25
Fast Cotton Gray VL—(A)	700
Fast Cotton Orange 4RL—(IG)	100
Ignamine Orange RR—(IG)	25
Rosanthrene Orange R—(I)	331
Triazol Fast Brown G—(GrE)	287
Triazol Light Yellow BL—(GrE)	254
Zambesi Black D—(A)	
Zambesi Black D—(IG)	1,000

Dyes for Artificial Silk

Azol Printing Bordeaux B Extra—(IG)	10
Azol Printing Violet 2R Extra—(IG)	10
Azonine Direct Violet R Conc. Paste—(IG)	100
Duranol Blue G Paste—(BD)	116
Duranol Orange G Paste—(BD)	116
Duranol Red G Paste—(BD)	212
SRA Red I—(BC)	1,815
SRA Red III—(BC)	1,616

Basic Dyes

Acridine Red PS—(DH)	11
Brilliant Acridine Orange R—(DH)	220
Brilliant Acridine Orange 3R—(DH)	110
Brilliant Rhoduline Blue R—(IG)	1,050
Phosphine G—(IG)	500
Rhoduline Sky Blue 3G—(IG)	353

Sulphur Dyes

Cross-Dye Green B—(BD)	4,670
Cross-Dye Green 2G Conc.—(BD)	2,254
Pyrogene Pure Blue 3GL—(I)	2,204
Sulphide New Blue BL	325
Thionol Brown O—(BD)	2,240
Thionol Brown R—(BD)	4,480
Thionol Yellow GR—(BD)	2,477

Color Lake Dyes

Azure Blue 1628 H Powder	25
Ares Blue I Powder—(IG)	100
Claret Red for Lake BN Paste—(IG)	100
Hansa Orange R Paste—(IG)	100
Hansa Yellow G Paste—(IG)	5,000
Hansa Yellow G Powder—(IG)	600
Helio Bordeaux BL Paste—(IG)	2,223

PEERLESS ANNOUNCES NEW BROWN

A new color known as Direct Fast Brown G is described in a leaflet issued by the Peerless Color Company, Plainfield, N. J. This color is said to yield a clear, bright golden shade of brown that finds wide use as a self-shade as well as in combinations. It is particularly suited for the dyeing of hosiery, cotton, rayon, and silk piece goods. An outstanding property is said to be its fastness to storing; it is leveling and non-staining with copper.

The leaflet gives its methods of dyeing and an attached swatch shows the shade.

INTERNATIONAL TEXTILE EXPOSITION

Although some visitors were overheard to remark that textile shows have been turned into machinery shows, nevertheless a record attendance and a decidedly active interest in the latest mechanical and chemical developments in the processing of textiles assured the success of the International Textile Exposition and National Power Show, held last week in the Mechanics Building, Boston, under the auspices of the Textile Exhibitors' Association. The exposition was open daily from 10 A. M. to 10 P. M. As usual, the first day's attendance did not forecast the crowds that filled the aisles and overflowed into the booths during the succeeding afternoons and evenings. When the show closed its doors on Saturday the unanimous opinion among exhibitors was that it had been one of the liveliest, most interesting and most instructive in the history of the industry.

The exhibits of moving machinery as usual proved to be the "box office attraction," this year largely for the reason that nearly all were featuring something *new* in textile equipment. Representatives from all branches of the textile industry gathered in Boston during the week from all over the country, from Canada and from abroad to see the evidence of what has been accomplished in textile manufacturing and processing machinery since the last exposition, held more than two years ago. Completeness of display had been promised by the management, but in addition there was something more in the variety and complexity of the exhibits, and especially in the numerous new features of each display, that conveyed an unforgetable impression of definite progress made in the equipment field. Here was visible evidence that during the prolonged dull period through which our textile industry has been passing there has always been a group earnestly working to develop and perfect new methods of manufacture, to keep our industry from stagnating, as it undoubtedly would if American mechanical genius should even for a short time turn aside from its vitally important work of producing equipment that will assure greater efficiency in manufacture and greater American textiles.

In this short space little more can be said without repeating that the Textile Exposition this year only proved again the ability of the American textile industry to maintain its place with other industries of the world in the steady advance in manufacturing methods.

Following are brief descriptions of a few of the displays of textile chemical processing machinery, equipment and chemical supplies.

American Laundry Machinery Company

Monel metal rotary hosiery dyeing machine in operation, equipped with glass end and illuminated to show dyeing operation. A smaller size belt-driven rotary hosiery dyeing machine and the well-known American humatic extractor, the latter also in operation.

National Aniline & Chemical Company

An assortment of various textiles showing the application of a number of the important National dyes on cotton, wool, silk and rayon. Representatives of the company from its several branches were in attendance.

Hussong Dyeing Machine Company

A new machine for dyeing pure silk and rayon, recently perfected, embodying many features not incorporated in previous types of Hussong dyeing equipment.

Fletcher Works, Inc.

A 40-inch motor-driven vertical extractor and a 26-inch motor-driven "Junior" extractor, both in operation, and both of the latest improved design with interlocking safety covers, ball bearings and push button control, for use in wool, cotton and rayon extracting. Representatives of the Hurricane Engineering Company, of Boston, New England agents for Fletcher Extractors, were in attendance.

Taylor Instrument Companies

A complete line of indicating and recording thermometers for textile processing, as well as a variety of temperature control apparatus.

Borne, Scrymser Company

A general line of lubricating and textile oils and greases, particularly featuring Breton oils for wool, the Breton Minerol Process for oiling of cotton and Brilliant Oils Ax, the spatterless lubricant. Interesting samples showing the use of these products were also displayed.

Oakley Chemical Company

Samples of many kinds of textile fabrics and materials which had been kier boiled, scoured or cleaned with the aid of Oakite materials. Special prominence was given to samples of cotton hosiery and underwear tubing which had been kier boiled with the aid of Oakite. Attention was called to the softness and whiteness of these samples due to the use of Oakite in the cleaning process. A booklet, entitled "Wet Finishing Textiles," was distributed from the booth.

Tolhurst Machine Works

In addition to the new rayon extractor, first displayed at the Knitting Arts Exhibition in Philadelphia, the Tolhurst display featured their 40-inch direct motor driven self-balancing extractor, as well as models, photos and blueprints.

E. I. du Pont de Nemours & Co.

A colorful display of a variety of fabrics, cotton, wool, silk and rayon piece goods, hosiery, neckwear,

scarfs, underwear and outerwear, dyed in various designs with Du Pont fast colors, showing two, three and four color effects, cross-dyeing and self-shades.

International Nickel Company

A comprehensive display of Monel metal in all its commercial forms, with dyehouse equipment particularly featured. Monel metal in sheets, and in a variety of machine and equipment parts for dyeing, bleaching and finishing machinery and power plant equipment.

The Permutit Company

A model Permutit water softening apparatus and a Ranarex CO_2 Combustion Indicator. The water softening apparatus attracted considerable attention from mill men, for the working mechanism was reduced to a size where it could be examined at close range and understood in its relation to the actual softening process.

GRATIFYING PROGRESS REPORTED IN THE SECOND CHEMICAL EQUIPMENT EXPOSITION

The Cleveland Exposition of the Association of Chemical Equipment Manufacturers, May 10--15, inclusive, according to reports of the association, is shaping up in noteworthy fashion.

This is the second equipment, materials and accessories show which the association has promoted for the benefit of technical men and industrial executives from the processing industries. The first was held in Providence, R. I., June 22-27, incl., 1925.

The American Association of Textile Chemists and Colorists, through two of its most important branches, the Northern New England and Rhode Island Sections, was officially represented at that exposition and held special meetings in conjunction with it. The textile chemists, dyers, finishers, etc., in attendance at these sessions were unanimous in their commendation of this type of exposition.

Various raw material displays of special interest to representatives of the textile industry will be included among the Cleveland displays, and many men from this great field will travel from different parts of the country to view them.

The Association of Chemical Equipment Manufacturers has predicted an attendance of 3,000 interested industrial and technical men from the processing industries. Its prediction of 1,000 such attendance as its first exposition was more than realized, and all indications point to the justification of its present forecast.

An unprecedented range of technical society cooperation in expositions reaching the chemical and process engineering field is under way in connection with the Cleveland exposition.

THREE NEW DU PONT COLORS

Three new colors have been announced by the Dyestuffs Department of E. I. du Pont de Nemours & Co.: Pontamine Black HS, Pontamine Brown DP and Sulphur Carbon SW.

Pontamine Black HS is described as a direct black of special type, particularly suited to fulfill the demand of half silk hosiery manufacturers, for a direct black on union material of cotton and natural silk. Full greenish shades very fast to washing, according to the announcement, are produced by aftertreatment with formaldehyde. The cotton and silk are dyed the same depth and tone.

The Pontamine Brown DP is intended exclusively for use by paper manufacturers. It is considerably brighter than the Pontamine Brown D3GP brand previously offered and is also slightly faster to acids.

Sulphur Carbon SW has been put out for the purpose of filling the requirements of dyers who wish to leave silk unstained in dyeing cotton.

INTERNATIONAL SALT MOVES

After being located for the past twenty years at 2 Rector Street, the International Salt Company is moving its offices on April 22 to the Farmers Loan & Trust Building, 475 Fifth Avenue, New York. The company's new telephone number will be Ashland 1102.

NEW BOOKS IN S. O. C. M. A. LIBRARY

The following new books and pamphlets have been added to the library of the Synthetic Organic Chemical Manufacturers' Association, and will be loaned to members on request:

Books: "Organic Syntheses," in five volumes, by Roger Adams, James B. Connant, H. T. Clarke, Oliver Kramm and Carl S. Marvel; "Solvents in Synthetic Organic Chemical Industry," by Donald W. McArdle; "Biological Stains," by H. J. Conn; "Trade Associations and Business Combinations" (Proceedings of the Academy of Political Science); "Popular Research Narratives," Vol. II, compiled by the Engineering Foundation.

Pamphlets: "My Experience with Certain Industrial Poisons," by Dr. William F. Boos; "On Nitrous Fume Poisoning," by Dr. William F. Boos; "Foreign Commerce Handbook, 1926-27," published by Chamber of Commerce of the United States; "A Banker's View of Trade Associations," by O. H. Cheney; "Relation of Public Press to Trade Association Information," by W. W. Woods; "Value of Current Business Statistics," by Mortimer B. Lowe, of the Bureau of Census.

D. C. Scott, in charge of intermediate sales for the Newport Chemical Works, Inc., who was confined to his home with an attack of influenza, returned to his desk several days ago.

Technical Notes from Foreign Sources

Dyeing Printing and Stenciling Cellulose Acetate Silk

In British patent No. 242,711 there are described processes for the dyeing, printing and stenciling of cellulose acetate artificial silks.

The dyeing of cellulose acetate with the aid of insoluble coloring matters and fatty substances, such as sodium sulphoricinoleate, is aided by the presence of secondary solvents. These solvents may be alkyl halides, such as tetrachloroethane and trochloroethylene, aromatic compounds, such as the cresols, alkylanilines, toluidines, chlorophenols and chlorobenzenes, and hydrogenated aromatic substances, such as hexahydrophenol, hexahydrocresols, hexahydrobenzene, deachydronaphthalene and tetrahydronaphthalene.

The presence of such solvents results in improved depth of shade, penetration and levelness, and consequently in economy in the consumption of the color. The mixture of the dyestuff, oil and solvent may be made in any order, much or little water may be used, and the mixture may be subsequently concentrated or dried before addition to the dye bath or printing paste. Insoluble diazotizable substances may be applied in this manner on the fiber, and the process may be employed for the production of varied effects on mixed goods.

Dyeing Loose Carded Wool

Loose carded wool comes in the form of endless bands obtained by carding the short fibers, with the result that the long stapled fibers are made to lie in a parallel direction at the same time. The dyeing of the carded wool is carried out best when the loose wool is not in a twisted condition. This form of dyeing possesses the advantage that the wool colored in this manner can be worked up to make fabrics dyed in one color or in several colors. For it is possible to mix the loose wool very readily with undyed white wool as well as with dyed wool. The carded wool is generally sufficiently clean to be dyed without any further treatment. In all cases treatment with a lukewarm solution of ammonia in water, concentration 1.3 per cent, is sufficient. It is only in the case where the dyer is handling a very greasy wool that the treatment with the ammonia liquor does not suffice, and it is then necessary to subject the wool to a half hour's treatment with a 2 per cent solution of soda at a temperature of 50 deg. Cent.

Inasmuch as the carded wool is used for different purposes and is hence put through different after-treatments, the fastness of the coloring matter on the dyed wool must meet certain requirements. Thus these requirements will vary in accordance to whether or not the wool is to be subjected to strong fulling or to weak fulling, or used in the manufacture of knitting yarns and hosiery or in the manufacture of printed wool fabrics.

It is evident that the loose condition of the carded wool gives rise to certain conditions in the dyeing which require careful attention. Thus, for example, this means that the dye liquor must not be too vigorously boiled, as otherwise the loose fibers will be felted together. For the same reason it is advisable to handle the material so far as possible by mechanical means during the dyeing process, so as to avoid as much handling as possible. The dyeing is best carried out on the beam, for in this case the loose wool is very easily and very thoroughly impregnated with the dye liquor without there being any necessity of setting the liquor in motion. It must be mentioned here that it is necessary to employ coloring matters in the dyeing of this loose wool which are particularly easily soluble in water, for the loose wool will act as a filter in the dye liquor and hold back all undissolved particles. It is very advisable for this reason to employ drum sieves, the dye liquor being admitted through the hollow axle of the sieve and coming in contact with the loose carded wool which is spread over the circumferential area of the drum. The best dyeing results seem to be secured by the use of such apparatus in which the direction of the flow of the current of dye liquor is changed from time to time.

Only the fastest dyestuffs can be used for the dyeing of loose wool which is to be put through a strong fulling process for manufacture into men's dress goods. These dyes are the Indigoes and other vat coloring matters, as well as the alizarine and chrome mordanted dyes. The easily soluble marks of acid alizarine black are used in dyeing black shades, and for blue shades Indigo is employed in a hydrosulphite bath. For green and olive the bottoming is accomplished with Indigo, and then Mordant Yellow, developed with the aid of bichromate, is dyed over the blue. Darker shades are obtained with the aid of Acid Alizarine Brown and a little yellow or by bottoming with Indigo and then overdyeing with Chrome Black and Chrome Yellow. Red shades are not required, but any suitable variety of this color can be obtained by the aid of red, black and yellow coloring matters and after-chroming in the usual manner. In using coloring matters to dye over an Indigo ground it is essential to employ those that do not require so much chrome salt as to destroy the effect of the Indigo ground. In this connection it has been found that the addition of lactic acid is of decided advantage.

The bleaching of the carded materials is best accomplished in a vacuum with the aid of an aqueous solution of sulphur dioxide at a temperature of 55 to

60 deg. Cent. Bleaching is necessary in preparing the wool for dyeing when it is later to be manufactured into women's dress goods, and especially when the wool is to be dyed in light delicate shades. In this case the dyer is not so limited in the selection of coloring matters, for the fastness of the color need not be so great as in the case of fabrics employed in the manufacture of men's clothes. The principal problem that faces the dyer in this case is to dye the goods as quickly and as safely as possible. Tests have accordingly been made to see if it is not possible to obtain all the desired results with the aid of acid and chrome coloring matters. The dyestuffs must be fast to washing, to ironing, to light and to perspiration, as well as to alkali, for the fabrics will be washed with soap. Furthermore, the coloring matters must be easily soluble and must give uniform shades on the wool. A very large number of dyes can hence be employed for this purpose.

In obtaining a fast black it is recommended that Acid Alizarine Black be employed with an afterchroming, while in the case of blue shades Indigo may be used when the fastness requirements are stringent. Navy blue which is always a very desirable color, can be obtained with the acid of Alkali Blue or Victoria Blue, or, better, with Patent Blue and Acid Violet. (Deutsche Faerber Zeitung, 1926, pp. 89-90.)

Crepe Effects on Delaines

In carrying out the creping process the unbleached delaine should be passed directly into the creping bath, which must be kept in the state of vigorous boiling. In this case the previous process of wetting-out with cold water is not necessary. The bleaching process, to which the fabric is subsequently subjected, should be effected by steeping the woolen pieces for several hours in a bath which contains sodium peroxide. For it has been found that bleaching by means of a bisulphite has a deleterious action on the creped fabrics. Other acids, which include particularly sulphuric acid, may be employed in the place of thiocyanic acid for the production of crepe effects.

For example, pleasing minutely creped delaines are obtained by treating the woolen pieces for fifteen minutes in a boiling liquor which contains 1 per cent of sulphuric acid. Delaine fabric usually shrinks during the scouring and bleaching process to the extent of 1.25 per cent in the length and 6 per cent in the width. On the other hand, the corresponding shrinkage that is produced by creping, when the process is carried out with the aid of thiocyanic acid and sulphuric acid, is 5.25 per cent in the length and 11 per cent in the width, and 3.5 per cent in the length and 11 per cent in the width, respectively.

The question of formation of undesirable creases in delaine fabrics was also gone into. This can be avoided by the use of a creping bath which contains 1,000 liters of water and 25 kilograms of sulphuric acid. The temperature of this bath is maintained at 87.5 deg. Cent. The pieces, which are ten of 80 meters each, are successively entered in open width into this bath through a mouthpiece. The liquor from the bath is sprayed into the mouthpiece from the bath during the entry of the fabric, this being accomplished by means of a pump. The pieces are well agitated for one hour in the creping bath and are then washed and bleached. Prolongation of the duration of the creping increases the minuteness of the crepe effects. (Bull. Soc. Ind. Mulhouse, 1925, Vol. 91, pp. 615-616, 616-617.)

Printing Textile Fabrics

Ethylene glycol and ethylene chlorohydrin are used as color solvents in the preparation of printing pastes in accordance with the process which is patented in British Patent No. 223,888.

For example, the printing paste which is suitable for application to weighted silk contains 4 grams of Chromazurol S Conc., 26 grams of water, 8 grams of chlorohydrin, 54 grams of starch and gum tragacanth thickening and 8 grams of chromium acetate of 20 deg. Be. concentration (density 1.16) or 4 grams of Eriochrome Red B, 12 grams of water, 4 grams of 20 per cent ammonia, 10 grams of ethylene glycol and 70 grams of a 50 per cent aqueous gum thickening. Ethylene glycol and ethylene chlorohydrin have no deleterious action on textile materials and may also be used advantageously in discharge pastes.

Dyeing Cotton Yarn in the Skein

In order to obtain good penetration of the dyestuff throughout the cotton fiber, it is necessary to subject the cotton yarn to a thorough cooking treatment before it is dyed. This is best accomplished with the aid of a little Turkey Red oil or similar substance, which is added to the cook liquor. This treatment has the effect of removing all of the fatty and waxy impurities that are contained in the cotton fibers. When large lots of yarn are being dyed it is best to conduct the process in machines, through which the dye liquor is circulated in a continuous stream. This allows uninterrupted dyeing and produces more uniform results than when the process is stopped.

As a general rule, the dyeing is effected with the aid of substantive coloring matters and the dye liquor made with a gradual addition of salt. When the developed coloring matters are employed for this purpose, the several stages of the process must be carried out in separate vessels. In the use of basic coloring matters the yarn must be given a treatment with tannin and tartar emetic before being dyed. When the dyeing is carried out in open vats, the coloring matter is added gradually and in small portions to the dye liquor. When dyeing light shades it is of greatest importance to see that the water used is free from iron salts.

(For further details see Dyest, 1925, p. 79.)

GOVERNMENT PUBLICATIONS DEALING WITH TEXTILES

A catalogue of Government publications dealing with textiles has been issued by the Department of Commerce, Bureau of Foreign and Domestic Commerce, compiled by Francis Wells of the Textile Division. A foreword explains that there are at present eleven Government bureaus which serve the interests of the textile industry in one way or another, and their published matter covers every phase of the industry from the production of raw materials to the sale and distribution of the finished product, both in domestic and foreign markets.

For some time the need has been apparent for a catalogue of these publications arranged in a form that would give factors in the trade a better knowledge of what the Government is publishing for their use and information. Although the various bureaus and departments issue general catalogues of their publications it is very tedious to pore over a mass of unrelated reports and articles covering a wide variety of subjects in order to find those of particular interest. As a consequence many business men manifest very little interest in what the Government publishes.

It is the purpose of this compilation to group the textile publications of the Government according to the major textile fiber or product discussed, and also to arrange them under subheadings which will give some idea of the scope of the report.

In addition to bulletins and reports that definitely relate to the textile industry, this catalogue lists the larger regular publications of the different bureaus which contain information of interest to the textile trade as well as to the other basic industries of the country. This compilation includes all bulletins published during the past eight or ten years, showing not only those still available for distribution, but also those which are out of print or of which the supply has been exhausted, and copies of which can be obtained only at libraries.

B. B. Fernald, chief chemist and divisional superintendent of the Imperial Printing & Finishing Company, Bellefont, R. I., has applied for a patent covering the printing of all textile fibers with cellulose compounds colored with aniline dyes. He claims these novelty prints to be fast to washing, sunlight, crocking and laundry chemic, and also that shades produced by this process are brighter than those obtained by other styles of printing. He also claims that these prints require no aging, steaming or subsequent soaping in order to develop the color.

It is understood that the prints produced by Mr. Fernald's process are to be put on the market under the trade-mark name of "Imp. Novelty Prints."

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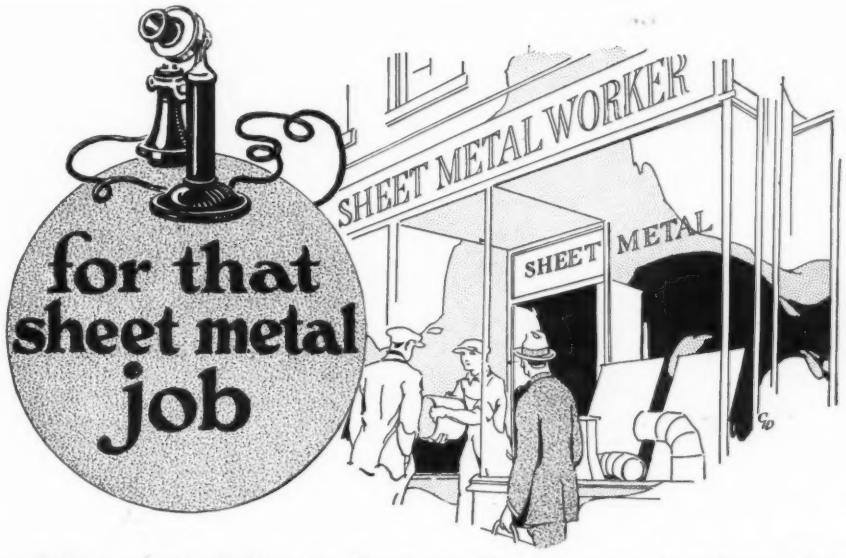

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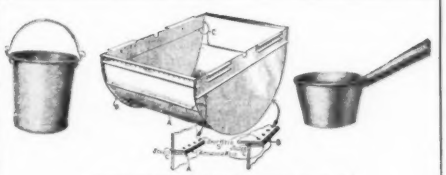

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